COORDINATED HIGHWAYS ACTION RESPONSE TEAM
STATE HIGHWAY ADMINISTRATION

CHART Release 12
Detailed Design

Contract SHA-06-CHART
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Work Order 35, Deliverable 4

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By
CSC

Revision	Description	Pages Affected	Date
0	Initial Release	All	09/20/2013

Table of Contents

Table of Figures

Table of Tables

1 Introduction

1.1 Purpose

This document describes the design of the software for CHART ATMS Release 12. This build provides the following new features:

- **Travel Time Enhancements:** CHART ATMS R12 includes several enhancements to the system's travel time related functionality.
    - The first set of travel time enhancements included in CHART ATMS R12 make it easier to provide different travel time messages on weekends, holidays, and week days. Weekday travel time messages can be targeted toward local commuters, while weekend and holiday messages can be tailored toward vacationers and out of state drivers. Prior to CHART ATMS R12, an operator would need to manually enable a different travel time message on each DMS to change the messages on weekends or holidays, and then re-enable the original message (if they remember) when the work week begins. CHART ATMS R12 allows multiple travel time (and toll rate) messages to be enabled on a single DMS and the system will determine which message is to be active based on day of week and holiday settings in each message. Holidays are defined within the system (rather than relying on standard holiday definitions) to allow not only actual holiday dates to be defined, but to also allow other heavy travel days such as the Friday prior to Memorial Day to be included. The travel time schedules for DMSs that existed prior to R12 continue to be used to specify the times of day when travel time messages are allowed to be displayed on each DMS.
    - Another travel time related enhancement included in CHART ATMS R12 allows travel times to be enabled or disabled system-wide for all DMSs owned by a specific organization. The ability to use this feature is controlled by a new user right that can be granted for specific organizations, so a user can be given the right to enable or disable travel time messages system-wide for only their organization without affecting the DMSs for other organizations. This feature only affects travel time messages; any traveler information message that contains a toll rate is not affected. The system-wide enable/disable feature overrides the individual enabled/disabled status of travel time messages, therefore messages can be globally enabled/disabled without affecting the individual enabled/disabled setting for each message. This feature helps in scenarios where statewide safety messages are sometimes desired instead of travel time messages. Normally travel time messages have a higher priority than safety messages, so the safety messages won't play while travel time messages are active. This new feature allows travel time messages to be disabled, allowing the safety messages to be displayed without having to individually manipulate arbitration queues of DMSs.
    - A new travel time summary page is included in CHART ATMS R12. This page allows the user to view all of the DMSs that normally display travel times (or are configured to do so, even if a travel time message is not currently enabled or active) without having to scroll through the larger DMS list. This page also allows the user to determine when signs that normally display travel times are not displaying travel times, such as when a user disables the travel time message and forgets to re-enable it, or if travel time messages have been disabled for an organization system wide. This page also allows the user to view messages that are in a DMS's arbitration queue but not currently displayed

due to a higher priority message. This allows the user to see when an event message is keeping a travel time message from being displayed (or vice versa) and the user can take an appropriate action if needed.

- The final travel time related enhancement included in CHART ATMS R12 is to allow CHART ATMS to accept and process travel time data from two different systems. Prior to R12 CHART ATMS retrieved travel time data exclusively from the INRIX system. Starting with R12, CHART ATMS must also retrieve data from an MDTA travel time system which emulates the interface provided by the INRIX system. While CHART ATMS was designed to allow travel time data from multiple sources, that aspect of the design is more fully implemented and tested as part of CHART ATMS R12.

- **CAD 911 Integration:** CHART ATMS R12 includes updates to enhance the coordination of events from CAD 911 (Primarily Maryland State Police)
  - This feature allows CHART operators to create CHART events that are linked to External Events. The operators work with the linked CHART events like other CHART events by managing Response Plans, Participants, Notifications, Associated Events, Surface Conditions and Nearby Weather Stations. Linked events are a one to one relationship between an external event and a CHART event. An external can only be linked to at most one CHART event and vice versa.
  - In addition to the normal capabilities an operator can choose to populate special sections of the linked CHART Event data using either data from the linked External event or information provide by a CHART operator. These special sections are called Linked Event Sections and for R12 the following linked event sections are supported: General Event Information, Event Location, Incident Information, and Lane Configuration.
  - When a Linked CHART Event is created, all linked event sections are populated from imported data via the External Event and will be updated as the External Event is updated. An operator can choose to override the updates from the external event for a linked event section by editing data in that section. Once the operator does this no further external updates will be propagated to the linked CHART event for that section. Once a linked event section is overridden on a linked CHART event, an operator can choose at any time to start using the external data again for that section.
  - Operators are also made aware of changes to the external data for a linked event section whether the section has been overridden (i.e. blocked for external update) or not. Once made aware of these update (via the details page or certain summary reports) the user can acknowledge the change allowing the change indicator to clear. This ability can be configured to be on/off per linked section type. This feature allows the operator a less manual way to bring in external event data into CHART and manage CAD events easier.
  - Operators can remove the link between an external event and a CHART event at any time.
  - An existing CHART event can be linked to an existing external event of the same time as long as neither event is currently linked. In this case the linked event sections will automatically be overridden to initially preserve the existing CHART event's data.

- **MD 511 Enhancements:** CHART ATMS R12 includes updates to the integration of exported CHART messages to MD511.
  - This goal of this feature is for CHART to export additional information to the MD511 system so it can automatically inform its users of special circumstances surrounding an

event and thus reduce the occasions when a CHART user must switch to the MD511 console. Specifically, the intent is for the MD511 system to use newly exported information to automatically place and remove floodgate messages when an event's impact is greater than its location might suggest. A floodgate message is a message placed at any level of the MD511 call tree and plays for all callers who reach that level. A second feature is the ability for CHART users to target groups to receive special notification for a given event.

- CHART users will be able to provide a geo-scope setting (Region / State / County / Route / Event Location) along with the current CHARTWeb message to escalate the scope of impact of a CHART Event. The current CHARTWeb message will turn into a generic public alert message available for use by CHARTWeb, MD511 IVR, MD511 Public Web, RITIS, or additional feeds.
- An optional text field for a Public Alert Audio message will also provide a Text to Speech preview. This text can be converted to audio by MD511 and automatically mapped into the call tree using the geo-scope. CHART users can preview the text as audio using the CHART ATMS Text to Speech engine without required use of the CHART audio substitution library. The final text to speech conversion will occur within MD511 and thus may differ from the preview.
- Optional flags to indicate if a Public Alert Text and/or Public Alert Audio Text are only drafts and thus not ready to be displayed to the public will also be available to a user.
- While creating or editing an event, CHART users will be able to optionally select from a list of Public Alert Categories initially defined as "None", "General", "Amber/Silver Alert", and "Commercial Vehicle Operations." When MD511 receives this selection through the CHART Exporter, the intent is it will send out notification of the event to a previously compiled subscriber group using a medium of their choice. Additionally the event may get special treatment when these users call into the IVR portion of MD511. See the MD511 system for details.

- **Decision Support Routing:** CHART ATMS R12 will enhance existing decision support features by allowing the system to locate potential upstream devices (DMSs, HARs, and cameras) that are not on the same route as the traffic event.

  - R12 decision support will significantly improve the GIS aspect of the subsystem. The GIS improvements will include adding full routing capability to the system and getting rid of the issue where the system cannot determine if a device that is "too close" to the traffic event is upstream or downstream. The full routing capability will allow the system to determine if the location of the device is potentially upstream from the traffic event regardless of whether the device and traffic event are on the same route or different routes. As a result, route synonyms, which used to be used to identify routes like 95 and 495 as the "same route" can be removed.
  - In addition to the existing maximum distance parameters, the system will support additional parameters to allow an administrator to configure things like "how many turns are too many to be considered upstream".
  - R12 will also include changes to the GUI to allow an operator to select and add suggested devices to the response plan directly from the new Suggestions Map.

- **H.264 Video:** CHART ATMS R12 adds new H.264-capable codecs to the suite of codecs supported by the CHART ATMS.

    - Starting with R12, CHART ATMS supports the Impath i5110-E encoder, the Impath i5110-D decoder, and Impath VSG 5K-series decoders along with other codecs supported in R11, the CoreTec MPEG4 encoder and decoder and the Impath MPEG2 encoder and decoder. (The Impath VSG 5K-series includes the 8-port VSG 5820-D and the 104-point VSG 5000-D, which are functionally identical.). Also CHART ATMS still supports analog video via the V1500 Video Switch.

    - A CHART monitor can be configured with any one of the supported "Video Receiving Devices": V1500 Switch, MPEG-2, MPEG-4, or, starting with R12, the Impath i5110-D decoder or an Impath VSG 5K-series decoder. A CHART video source can be configured with any number of "Video Sending Devices": V1500 Switch, MEG-2, MPEG-4, or, starting with R12, the Impath i5110-E encoder. As always, a CHART monitor can natively display any video source which has the matching Video Sending Device configured (as the only Video Sending Device or as one of multiple Video Sending Devices configured). If multiple Video Sending Devices are configured, CHART ATMS automatically uses the matching type of sending device.

    - Note that although the new Impath codecs support multiple compression types, only H.264 compression will be supported for these codecs within the CHART ATMS. Note that Impath does not guarantee that their H.264 decoder will decode any H.264 except that encoded by their own H.264 encoders (this is expected industry-standard practice, as there is much variation allowed within the H.264 standard).

1.2 Objectives

The main objective of this detailed design document is to provide software developers with a framework in which to implement the requirements identified in the CHART ATMS R12 Requirements document. A matrix mapping requirements to the design is presented in Section 7 (Mapping to Requirements).

1.3 Scope

This design is limited to Release 12 of the CHART ATMS. It addresses both the design of the server components of CHART ATMS and the Graphical User Interface (GUI) components of CHART ATMS to support the new features being added. This design does not include designs for components implemented in earlier releases of the CHART ATMS.

1.4 Design Process

The design was created by capturing the requirements of the system in UML Use Case diagrams. Class diagrams were generated showing the high level objects that address the Use Cases. Sequence diagrams were generated to show how each piece of major functionality will be achieved. This process was iterative in nature – the creation of sequence diagrams sometimes caused re-engineering of the class diagrams, and vice versa.

1.5 Design Tools

The work products contained within this design were extracted from the Enterprise Architect design tool. Within this tool, the design is contained in the project named "chartdesign" in the folder named "CHART-ATMS-R12".

1.6 Work Products

The final CHART ATMS Release 12 design consists of the following work products:

- Human-Machine Interface section which provides descriptions of the screens that are changing or being added in order to allow the user to perform the described uses.
- Use Case diagrams that capture the requirements of the system
- UML Class diagrams, showing the software objects which allow the system to accommodate the uses of the system described in the Use Case diagrams
- UML Sequence diagrams showing how the classes interact to accomplish major functions of the system
- Requirement Verification Traceability Matrix that shows how this design meets the documented requirements for this feature

The CHART ATMS Archive database stores data from the CHART operational system as part of a permanent archive. The CHART ATMS Archive database design is a copy of the CHART ATMS operational system for those tables containing system, alert, traveler information messages and their underlying data, and event log information. In addition, the CHART ATMS Archive database stores detector data. In R12, the archive will be changed to include the new table and new columns added to existing tables for the Travel Time Enhancements as specified in section 2.4.1.1.2.4.1 above.

2 Architecture

The sections below discuss specific elements of the architecture and software components that are created, changed, or used in CHART ATMS Release 12.

2.1 Network/Hardware

CHART ATMS Release 12 features do not impact the network or hardware architecture of the CHART system.

2.2 Software

CHART ATMS uses the Common Object Request Broker Architecture (CORBA) as the base architecture, with custom built software objects made available on the network allowing their data to be accessed via well defined CORBA interfaces. Communications to remote devices use the Field Management Server (FMS) architecture. Newer external interfaces such as the User Management web service, Data Exporter, and GIS service employ a web services architecture combining an HTTP request/response structure to pass XML messages.

Except where noted in the subsections below, CHART ATMS Release 12 features do not impact the software architecture of the CHART ATMS.

2.2.1 COTS Products

2.2.1.1 CHART ATMS

CHART ATMS uses numerous COTS products for both run-time and development. No additional COTS products are added as part of R12. The following table contains existing COTS products that have not changed for CHART ATMS Release 12:

Product Name	Description
Apache ActiveMQ	CHART uses this to connect to RITIS JMS queues.
Apache Jakarta Ant	CHART uses Apache Jakarta Ant 1.6.5 to build CHART applications and deployment jars.
Apache Tomcat	CHART uses Apache Tomcat 6.0.29 as the GUI web server.
Apache XML-RPC	CHART uses the apache xmlrpc java library 3.1.2 protocol that uses XML over HTTP to implement remote procedure calls. The video Flash streaming "red button" ("kill switch") API uses XML over HTTP remote procedure calls.
Bison/Flex	CHART uses Bison and Flex as part of the process of compiling binary macro files used for performing camera menu operations on Vicon Surveyor VFT cameras.
bsn.autosuggest	The event resource search feature and the EORS integration feature use version 2.1.3 of the bsn.autosuggest JavaScript code from brandspankingnew.net. This tool is freely available and is included as source code in the CHART GUI. It provides a simple JavaScript tool that can be associated with a text entry field. It uses AJAX to provide search results / suggestions as the user types.
CoreTec Decoder Control	CHART uses a CoreTec supplied decoder control API for commanding CoreTec decoders.
Dialogic API	CHART uses the Dialogic API for sending and receiving Dual Tone Multi Frequency (DTMF) tones for HAR communications.

Product Name	Description
Flex3 SDK	The CHART GUI will use the Flex3 SDK, version 3.3 to provide the Flex compiler, the standard Flex libraries, and examples for building Flex applications.
GIF89 Encoder	Utility classes that can create .gif files with optional animation. This utility is used for the creation of DMS True Display windows.
JAXB	CHART uses the jaxb java library to automate the tedious task of hand-coding field-by-field XML translation and validation for exported data.
JDOM	CHART uses JDOM b7 (beta-7) dated 2001-07-07. JDOM provides a way to represent an XML document for easy and efficient reading, manipulation, and writing.
JacORB	CHART uses a compiled, patched version of JacORB 2.3.1. The JacORB source code, including the patched code, is kept in the CHART source repository.
JavaMail API	The CHART Notification Service uses the JavaMail API 1.4.4, an optional Java package which provides SMTP e-mail support.
Java Run-Time (JRE)	CHART uses 1.7.0_07.
JavaService	CHART uses JavaService to install the server side Java software components as Windows services.
JAXEN	CHART uses JAXEN 1.0-beta-8 dated 2002-01-09. The Jaxen project is a Java XPath Engine. Jaxen is a universal object model walker, capable of evaluating XPath expressions across multiple models.
JoeSNMP	CHART uses JoeSNMP version 0.2.6 dated 2001-11-11. JoeSNMP is a Java based implementation of the SNMP protocol. CHART uses for commanding iMPath MPEG-2 decoders and for communications with NTCIP DMSs.
JSON-simple	CHART uses the JSON-simple java library to encode/decode strings that use JSON (JavaScript Object Notation).
JTS	CHART uses the Java Topology Suite (JTS) version 1.8.0 for geographical utility classes.
Log4J	CHART uses the log4J version 1.2.15 for logging purposes.
NSIS	CHART uses the Nullsoft Scriptable Installation System (NSIS), version 2.45, as the server side installation package.
Nuance Text To Speech	For text-to-speech (TTS) conversion CHART uses a TTS engine that integrates with Microsoft Speech Application Programming Interface (MSSAPI), version 5.1. CHART uses Nuance Vocalizer 4.0 with Nuance SAPI 5.1 Integration for Nuance Vocalizer 4.0.
OpenLayers	The Integrated Map feature uses the Open Layers JavaScript API 2.11 (http://openlayers.org/) in order to render interactive maps within a web application without relying on vendor specific software. Open Layers is an open source product released under a BSD style license which can be found at (http://svn.openlayers.org/trunk/openlayers/license.txt).
O'Reilly Servlet	Provides classes that allow the CHART GUI to handle file uploads via multi-part form submission.
Prototype Javascript Library	The CHART GUI uses the Prototype JavaScript library, version 1.7, a cross-browser compatible JavaScript library provides many features (including easy Ajax support).
SAXPath	CHART uses SAXPath 1.0-beta-6 dated 2001-09-27. SAXPath is an event-based API for XPath parsers, that is, for parsers which parse XPath expressions.
MSSQL Server	CHART uses MS SQLServer (2008 R2) as its database and uses the MS SQL Server JDBC libraries (sqljdbc4.jar) for all database transactions.
SQLServer JDBC Driver	CHART uses this driver to lookup GIS related data and also to store Location Aliases in SQL Server databases.
Velocity Template Engine	Provides classes that CHART GUI uses in order to create dynamic web pages using velocity templates, CHART uses Velocity version 1.6.1 and tools version 1.4.
Vicon V1500 API	CHART uses a Vicon supplied API for commanding the ViconV1500 CPU to switch video on the Vicon V1500 switch.

2.2.2 Deployment /Interface Compatibility

2.2.2.1 CHART ATMS

2.2.2.1.1 External Interfaces

This section describes the external interfaces being added in Release 12 of CHART ATMS.

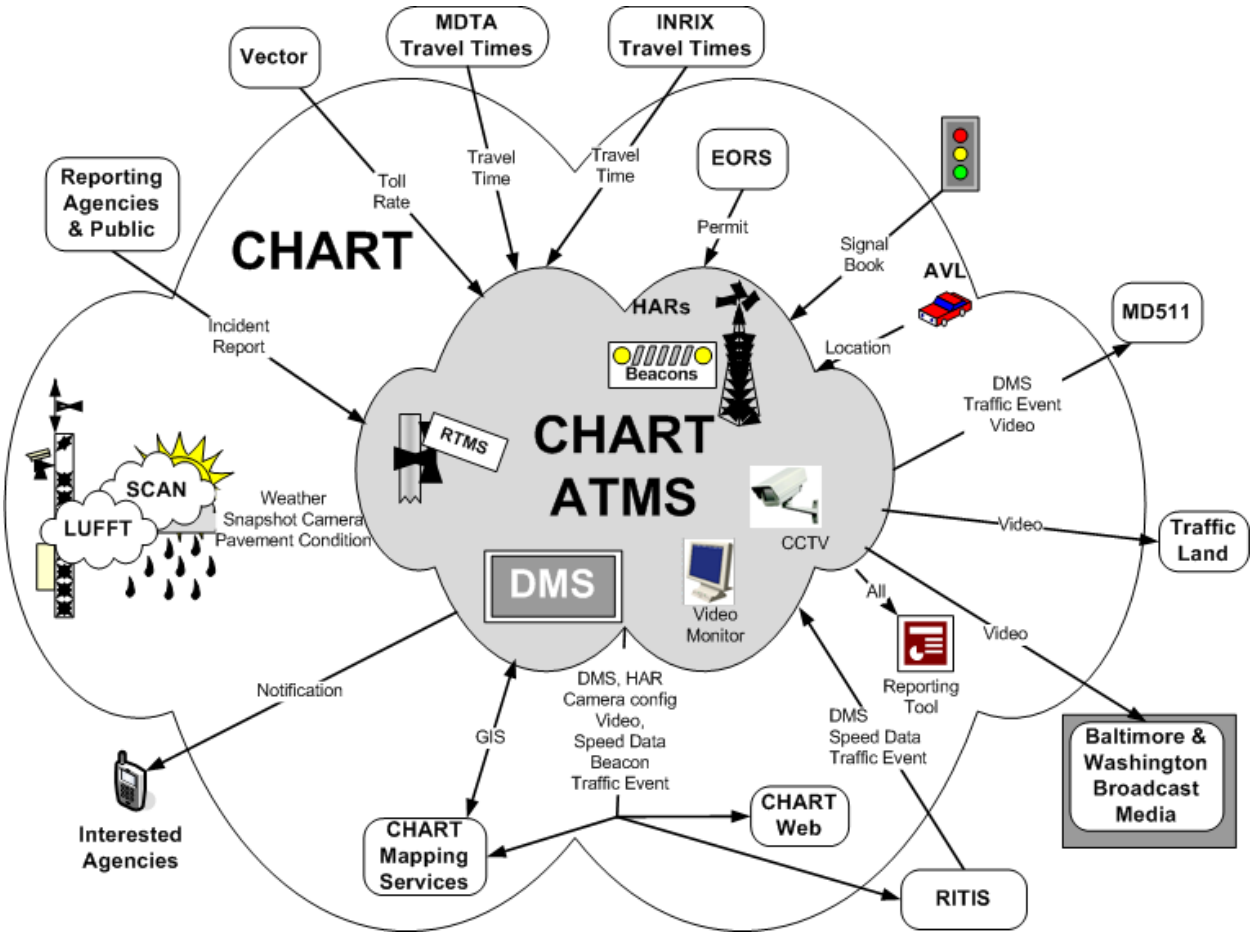


Figure 2-1. CHART and External Interfaces

The external interfaces modified/added for R12 are:

1. A second instance of the INRIX Import Service will be run on the CHART ATMS server and will connect to the MDTA Travel Time system to retrieve travel times provided by MDTA for high occupancy toll lanes.
2. The Traffic Event export message will contain additional fields to support automatic MD511 activities such as floodgate message creation and the sending of notifications to MD511 users who have subscribed to Public Alert Categories

Server and GUI deployment diagrams are shown in the next two figures. The server deployment diagram is changed in R12 to show the CHART ATMS interface to the MDTA Travel Time system.

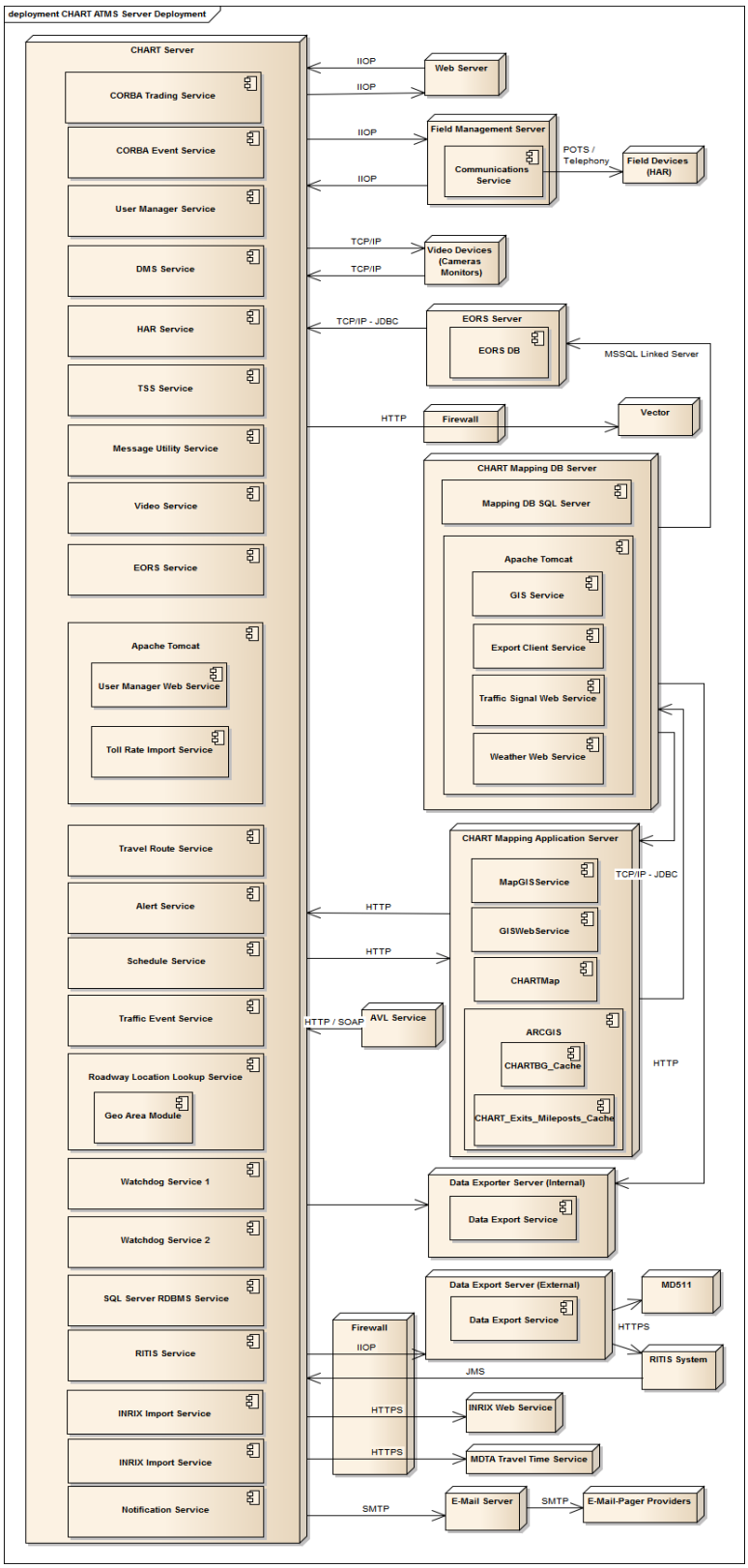


Figure 2-2. R12 Server Deployment

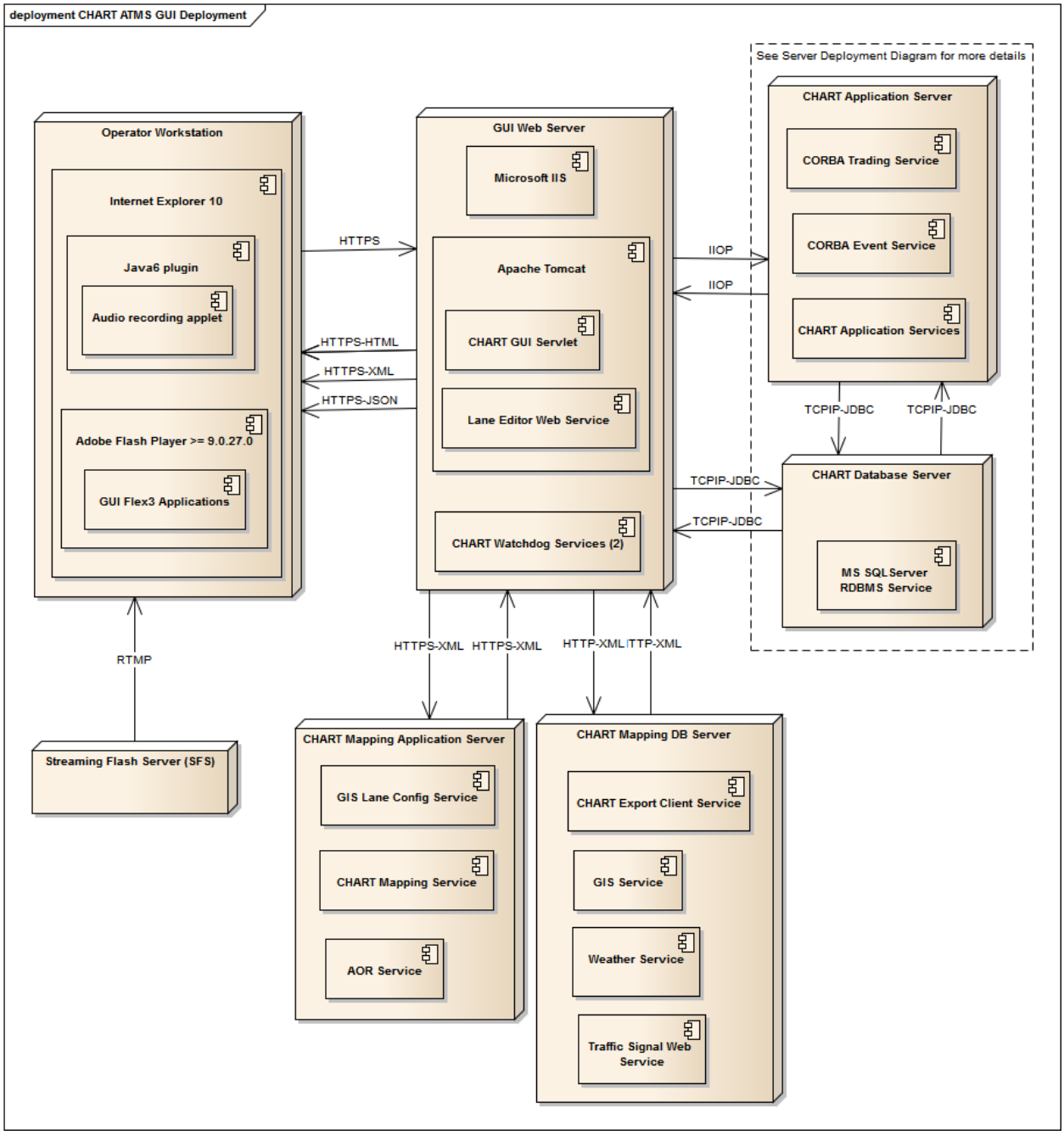


Figure 2-3. R12 GUI Deployment

2.2.2.1.2 Internal Interfaces

This section describes the internal interfaces being added or modified in Release 12 of the CHART system.

1. The R12 Travel Time Enhancements feature requires modification to several existing CORBA interfaces and structs to support changes to traveler information messages for

DMSs. Each message will now have an enabled flag, a holiday applicability setting, and day of week settings. Furthermore, changes will be made to the existing Organization CORBA interface to allow it to support a configuration which contains the existing organization name and a new flag that indicates if travel time messages are enabled for the organization.

2.3 Security

This section describes the security being added or modified in Release 12 of CHART ATMS. Unless otherwise noted, features being added for CHART ATMS Release 12 do not change security aspects of the CHART ATMS.

2.4 Data

CHART ATMS Release 12 will be tested with the fielded MS SQL Server version.

2.4.1 Data Storage

The CHART ATMS stores most of its data in a non-spatial MS SQL Server database. Additionally the Integrated Map feature adds the ability to store location aliases to the spatial SQL Server database. Some data is stored in flat files on the CHART servers.

This section describes all of these types of data.

2.4.1.1 Database

2.4.1.1.1 Database Architecture

Except as noted, CHART ATMS Release 12 features do not impact the overall architecture of the CHART ATMS database.

2.4.1.1.2 Logical Design

2.4.1.1.2.1 CHART Entity Relationship Diagram (ERD)

CHART ATMS Database entity relationship diagram for R12 are shown below in the fifteen figures which follow, Figure 2-3 through Figure 2-17. These figures should be mentally arranged into a grid five images wide and three images tall, if desired to follow the connector lines which go off the pages. Pages 2-1 through 5-1 are to the right of Page 1-1, and Pages 1-2 and 1-3 are below Page 1-1. For instance, the connector lines which come out the bottom of Page 2-1 (Figure 2-4) come into the top of Page 2-2 (Figure 2-9). The Table Definition Report sections that follow describe the changes that will be made for R12

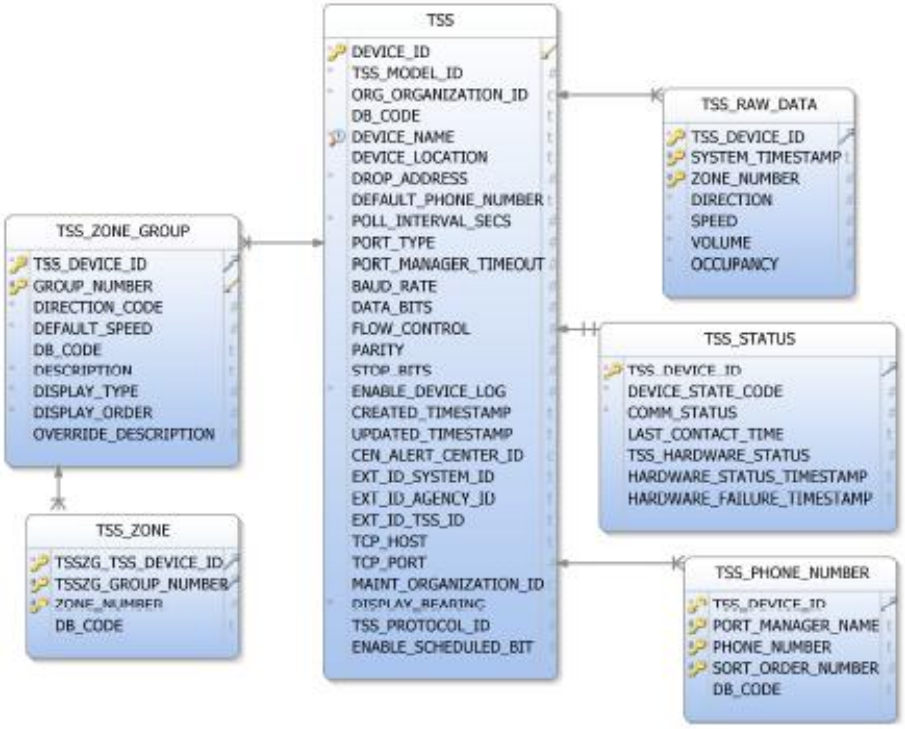


Figure 2-3. CHART_Live ERD, Page 1-1

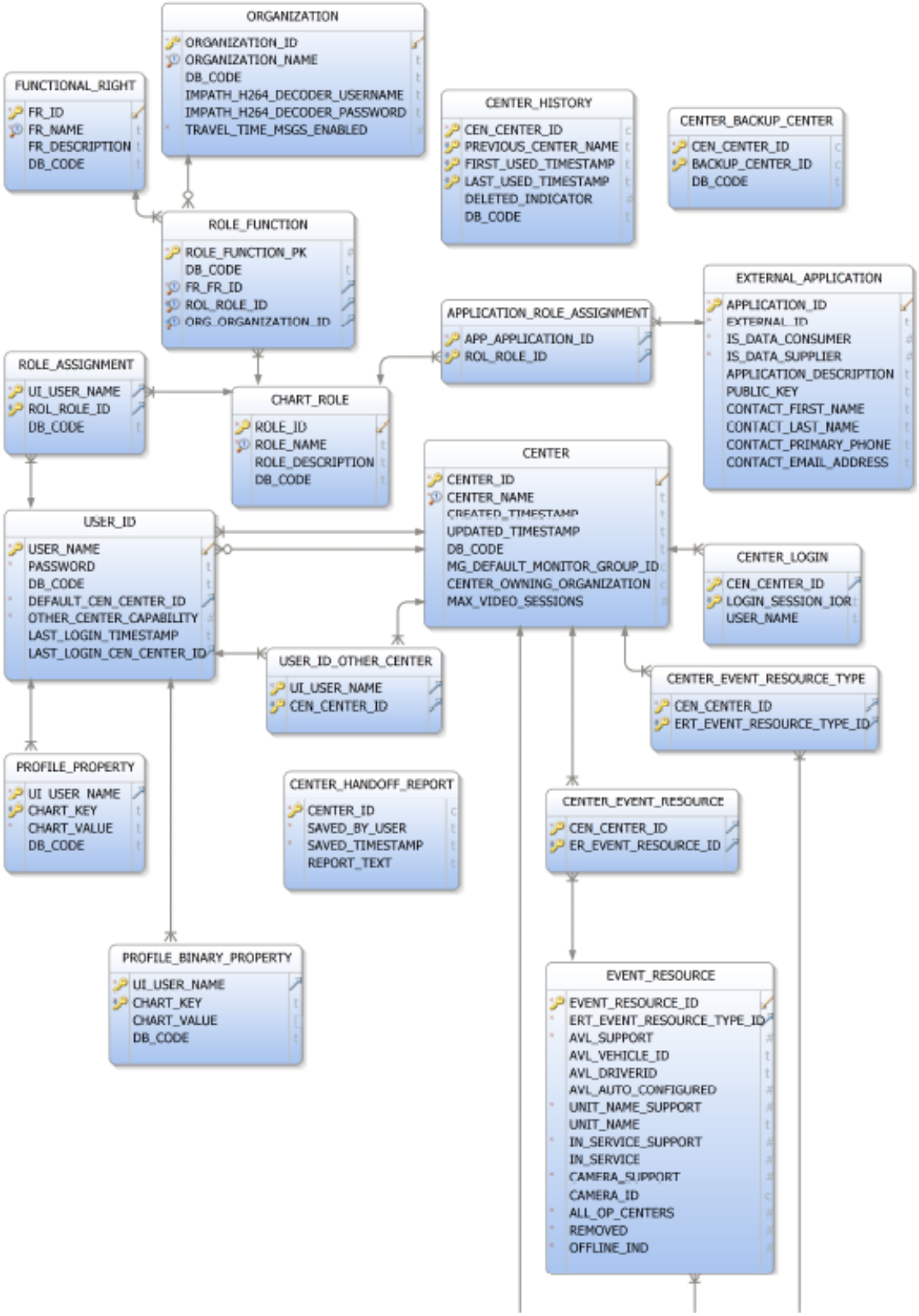


Figure 2-4. CHART_Live ERD, Page 2-1

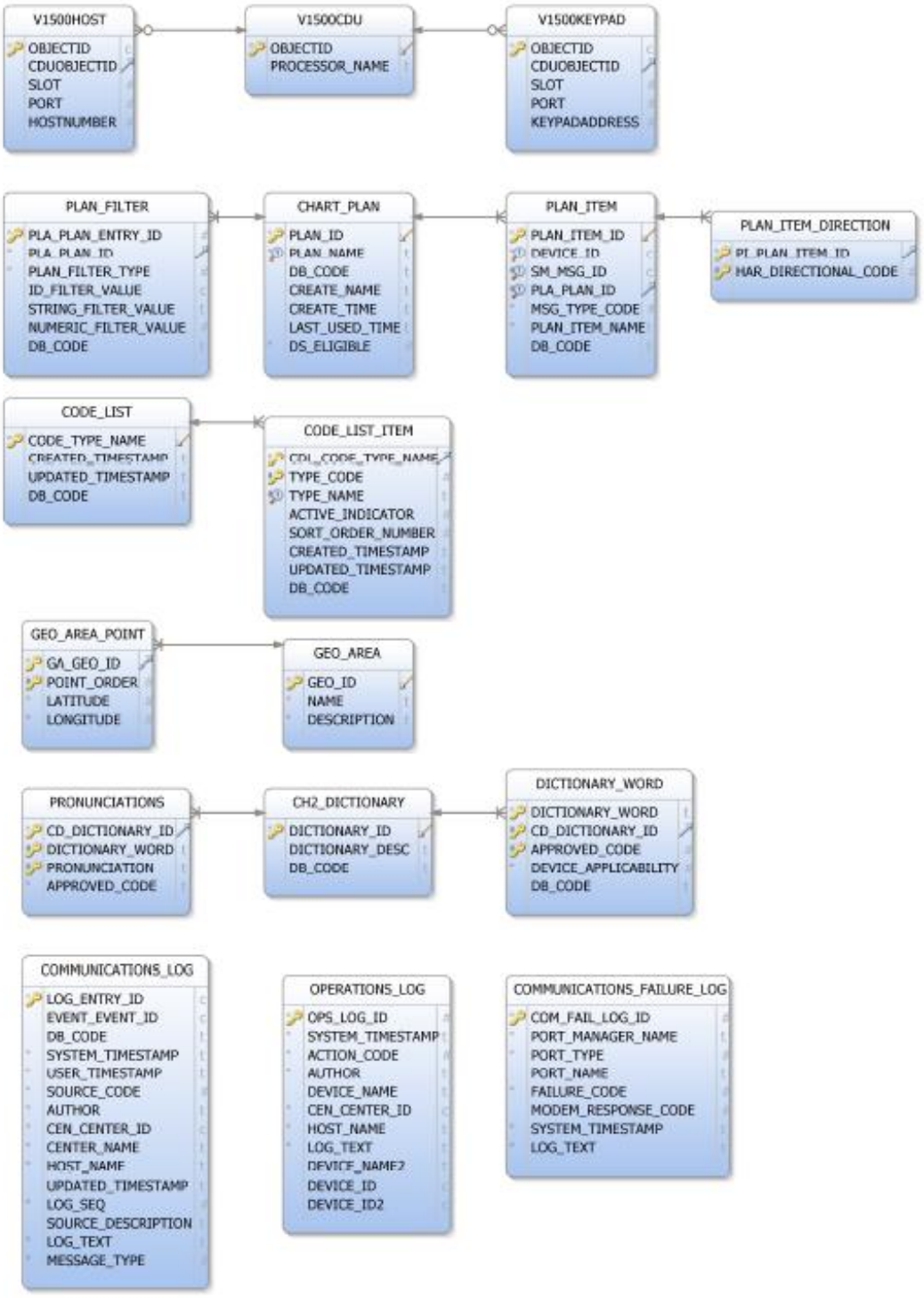


Figure 2-5. CHART_Live ERD, Page 3-1

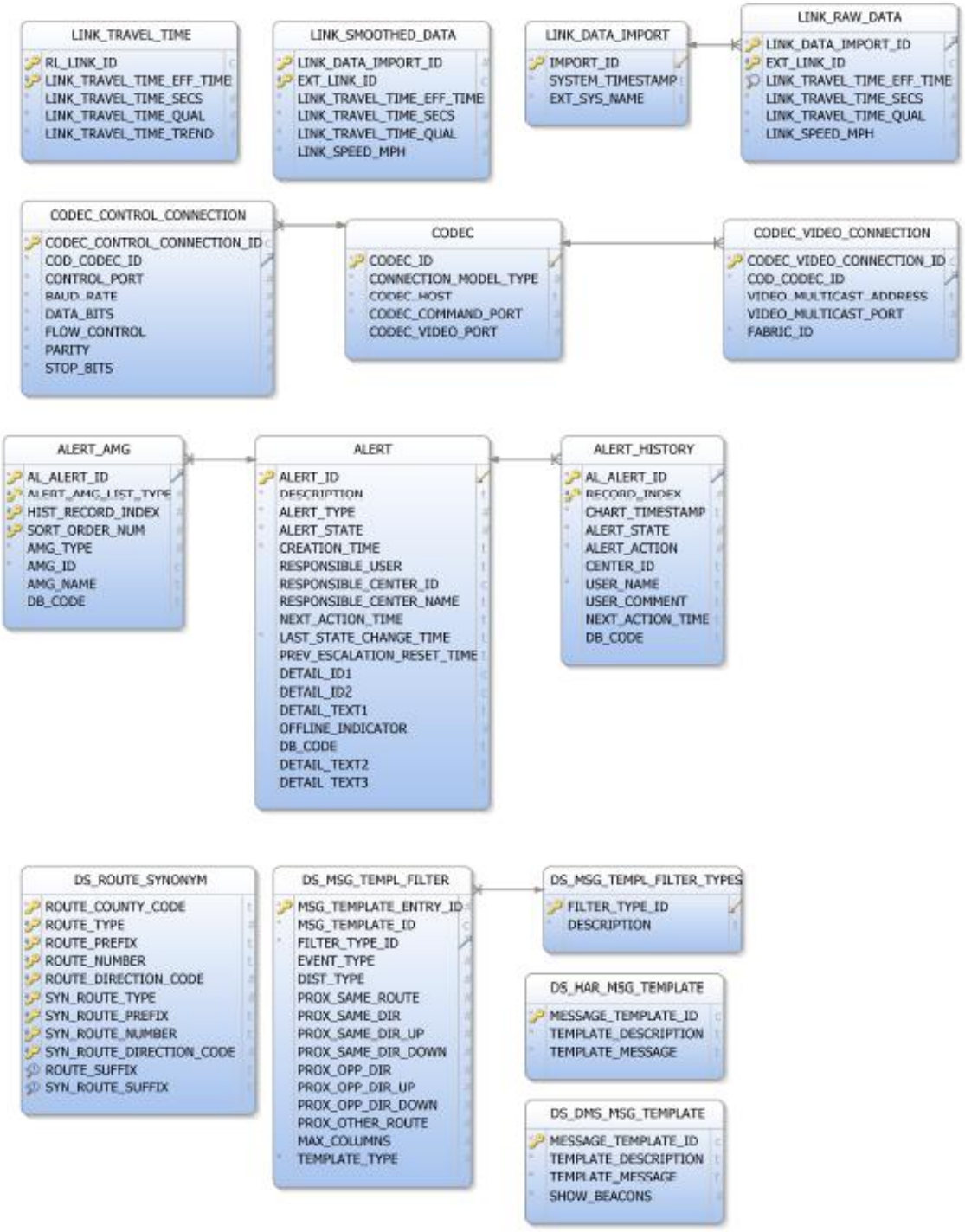


Figure 2-6. CHART_Live ERD, Page 4-1

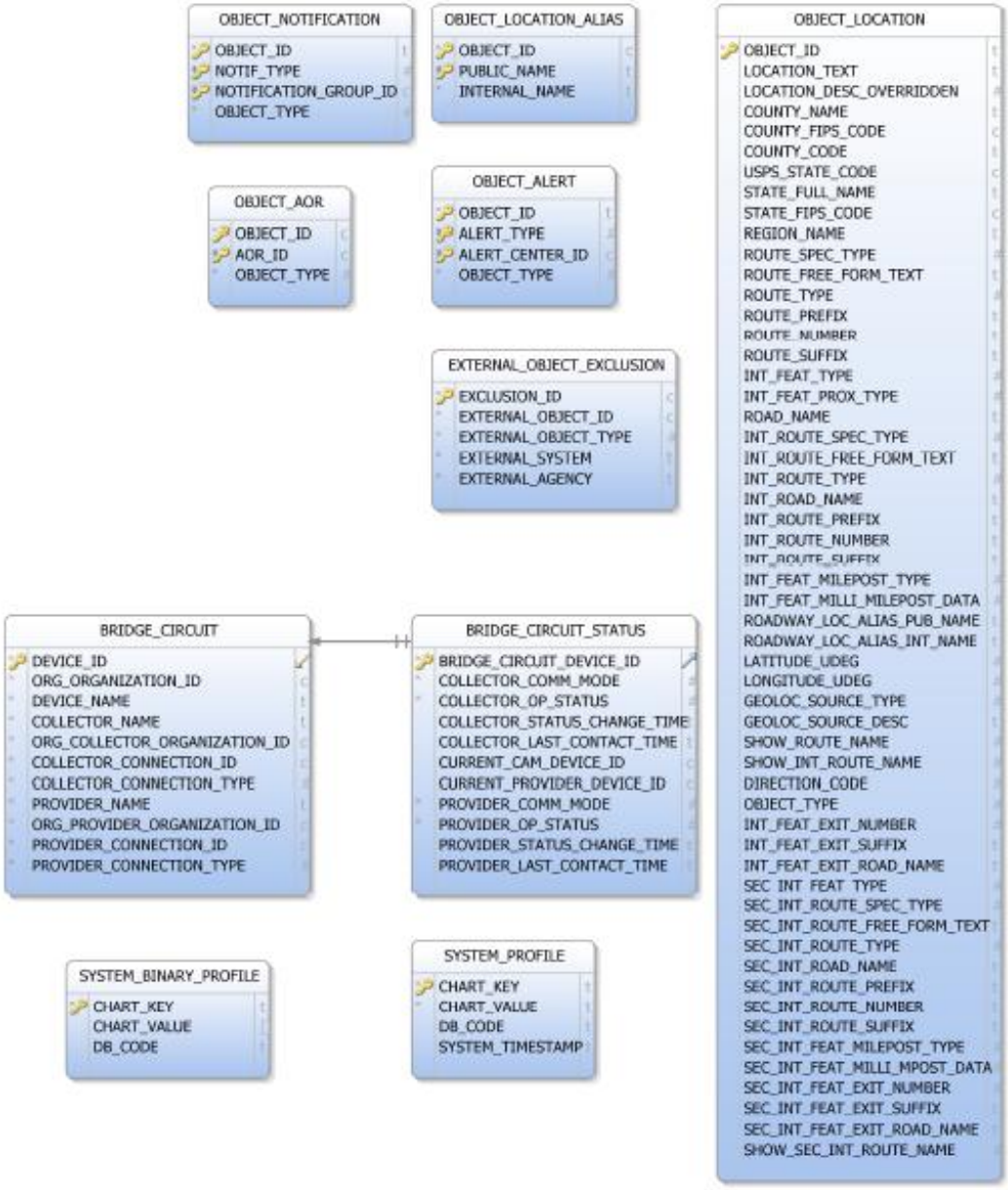


Figure 2-7. CHART_Live ERD, Page 5-1

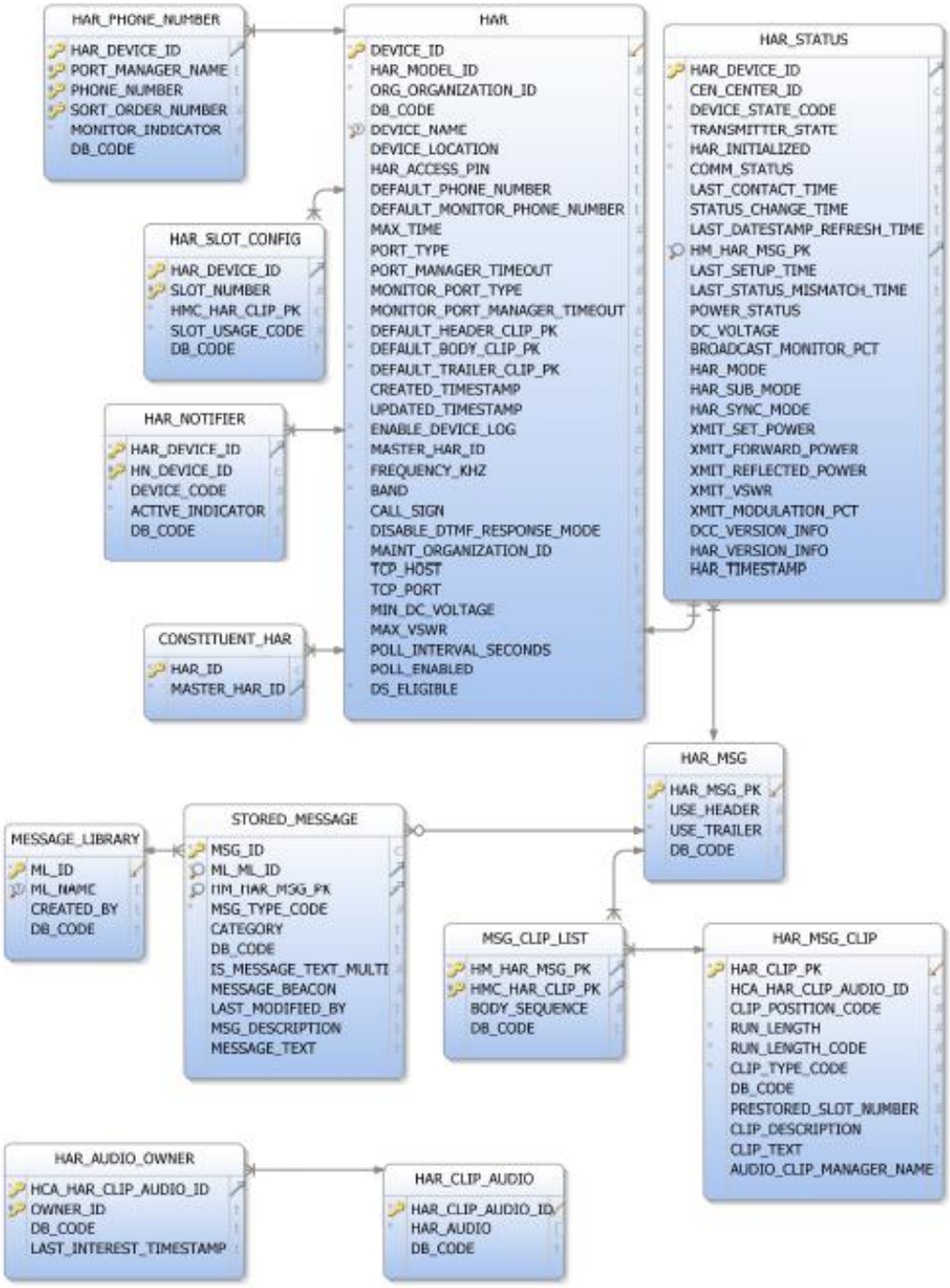


Figure 2-8. CHART_Live ERD, Page 1-2

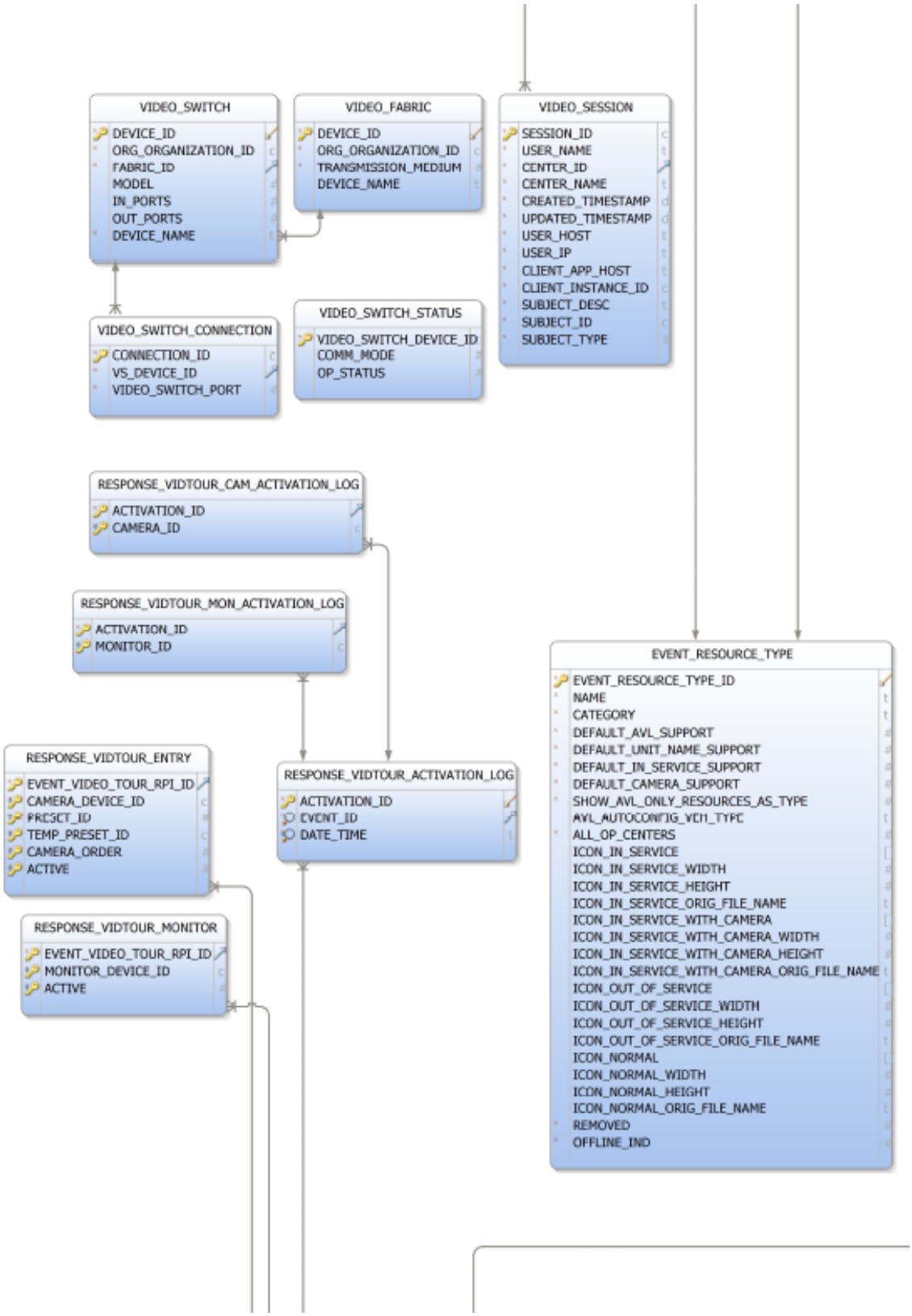


Figure 2-9. CHART_Live ERD, Page 2-2

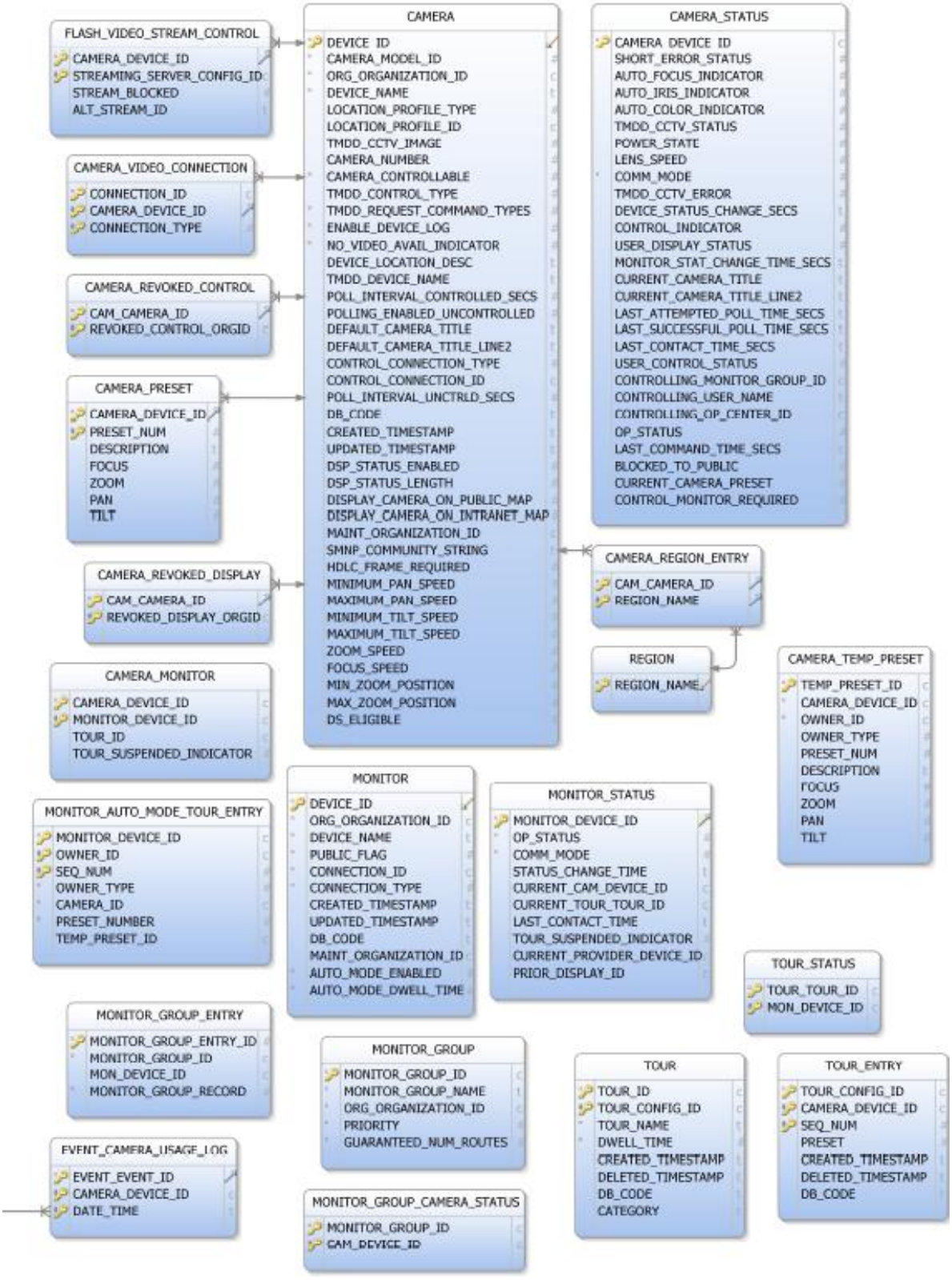


Figure 2-10. CHART_Live ERD, Page 3-2

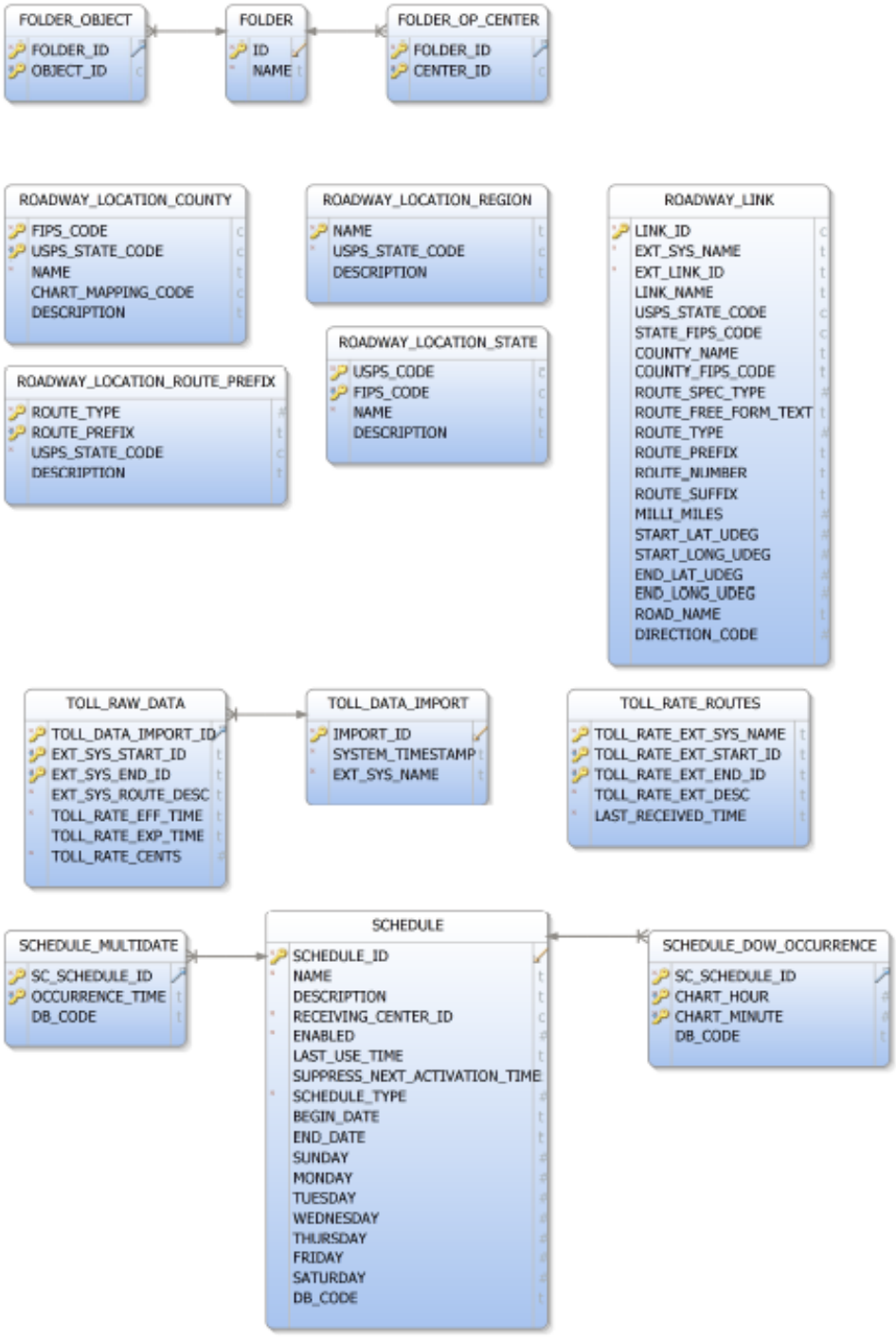


Figure 2-11. CHART_Live ERD, Page 4-2

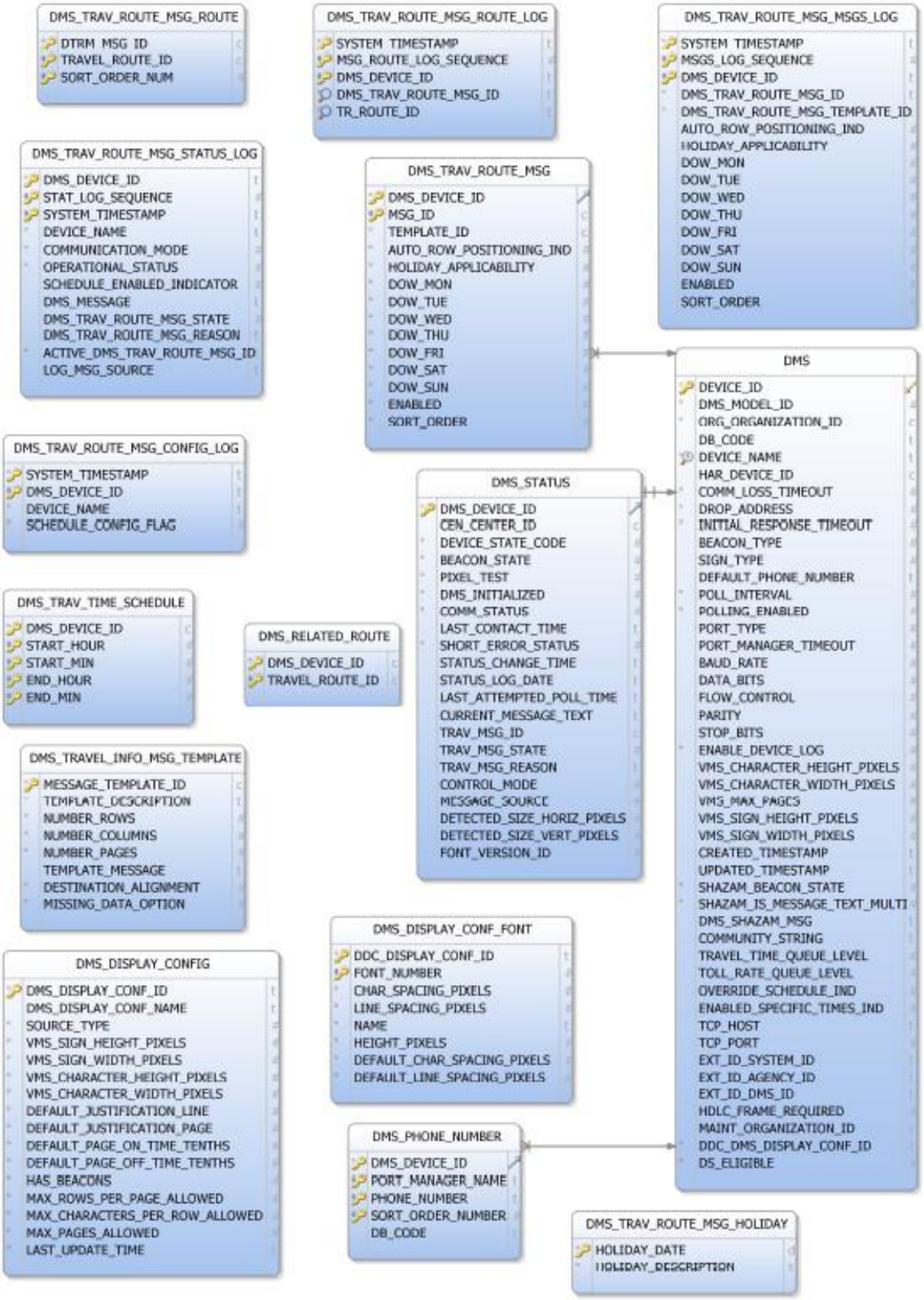


Figure 2-12. CHART_Live ERD, Page 5-2

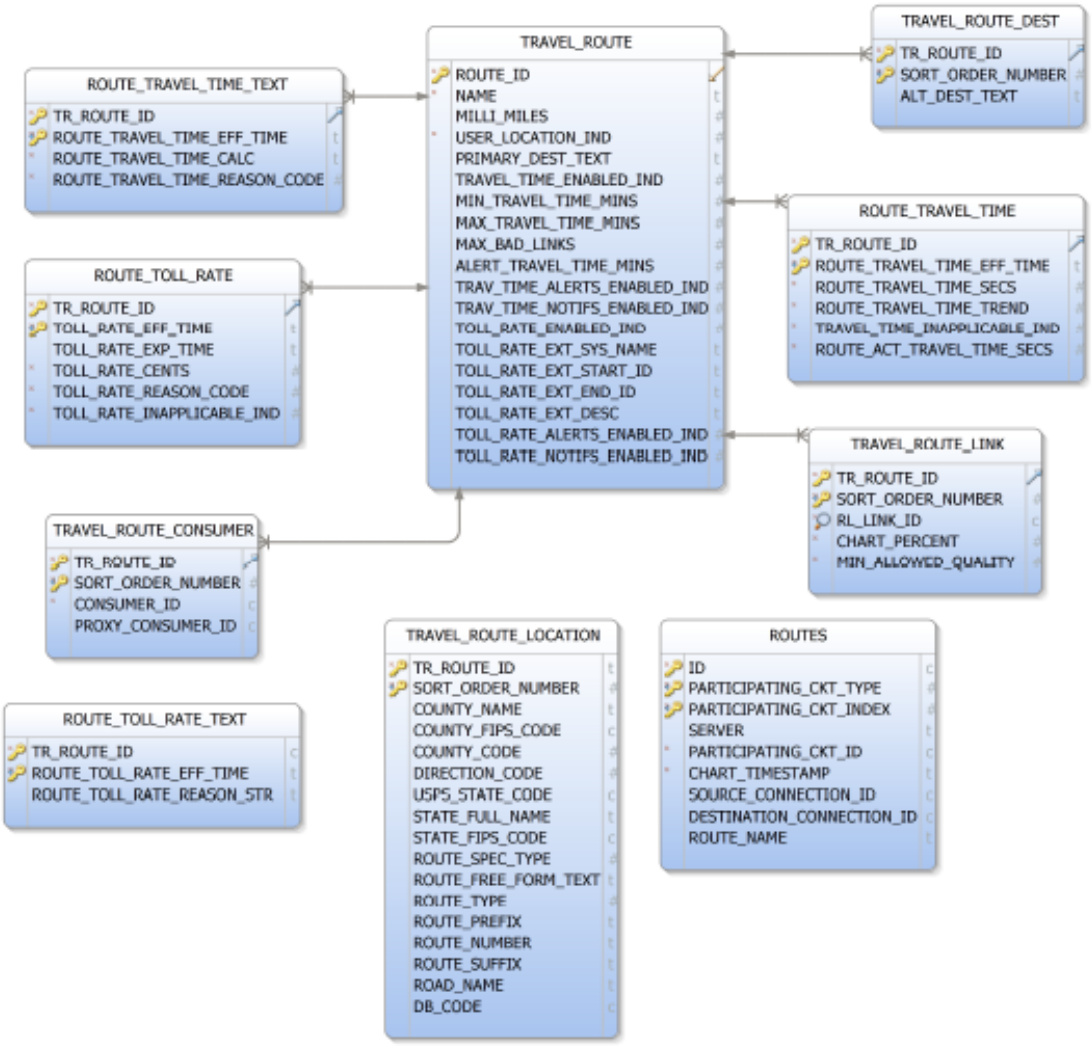


Figure 2-13. CHART_Live ERD, Page 1-3

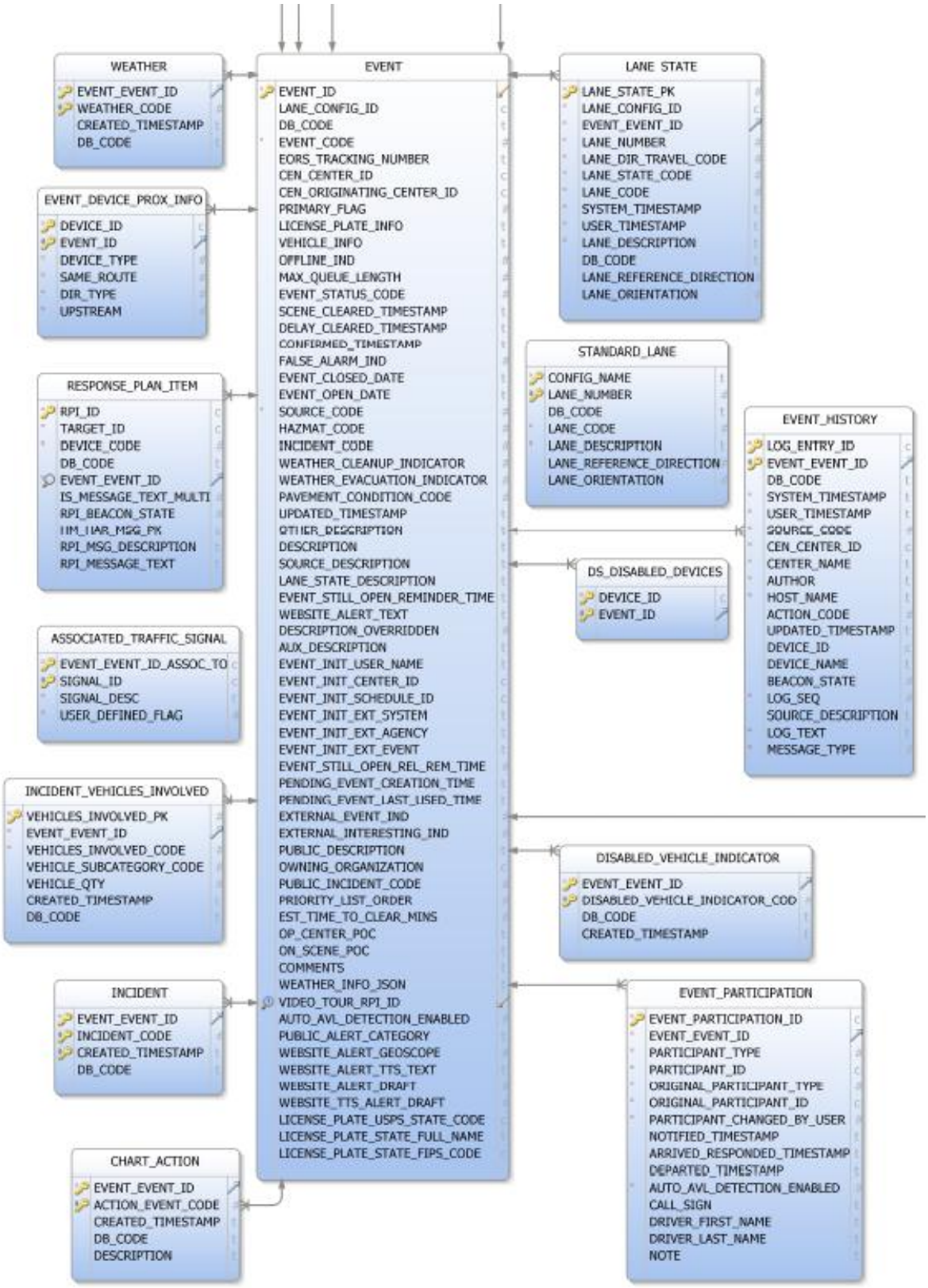


Figure 2-14. CHART_Live ERD, Page 2-3

Figure 2-15. CHART_Live ERD, Page 3-3

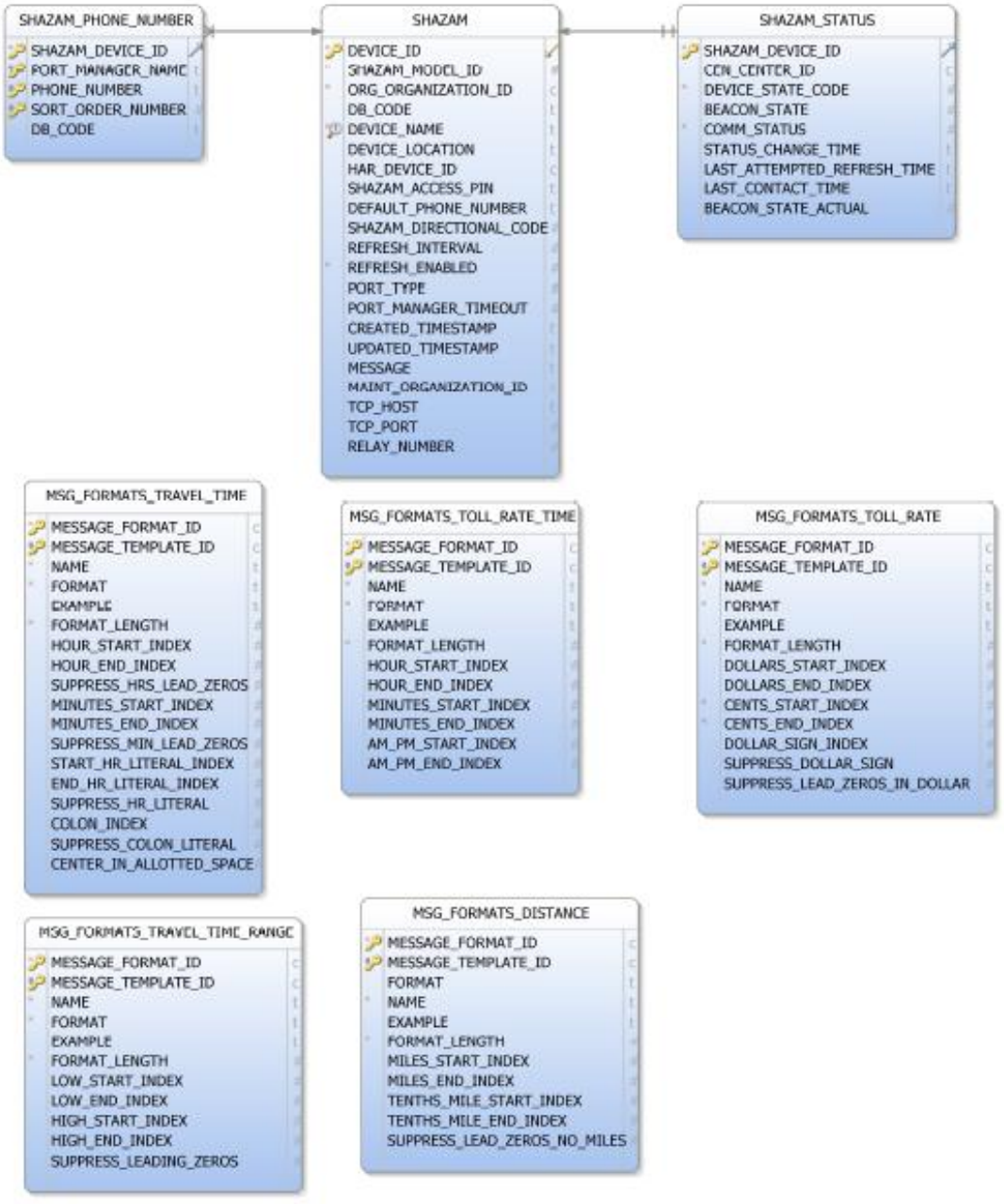


Figure 2-16. CHART_Live ERD, Page 4-3

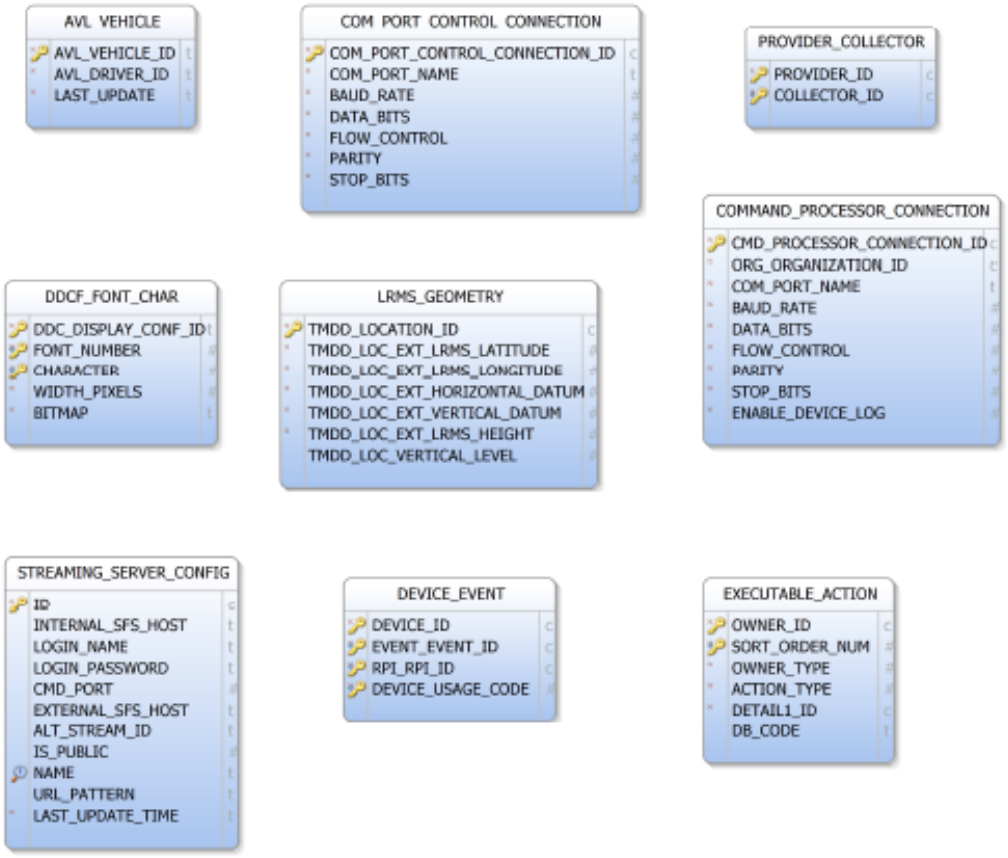


Figure 2-17. CHART_Live ERD, Page 5-3

2.4.1.1.2.2 CHART Archive Database Entity Relationship Diagram (ERD)

CHART ATMS Archive Database entity relationship diagrams are shown below in the multiple pages of figures labeled collectively as one Figure. These diagrams represent the archive database design for CHART ATMS R12.

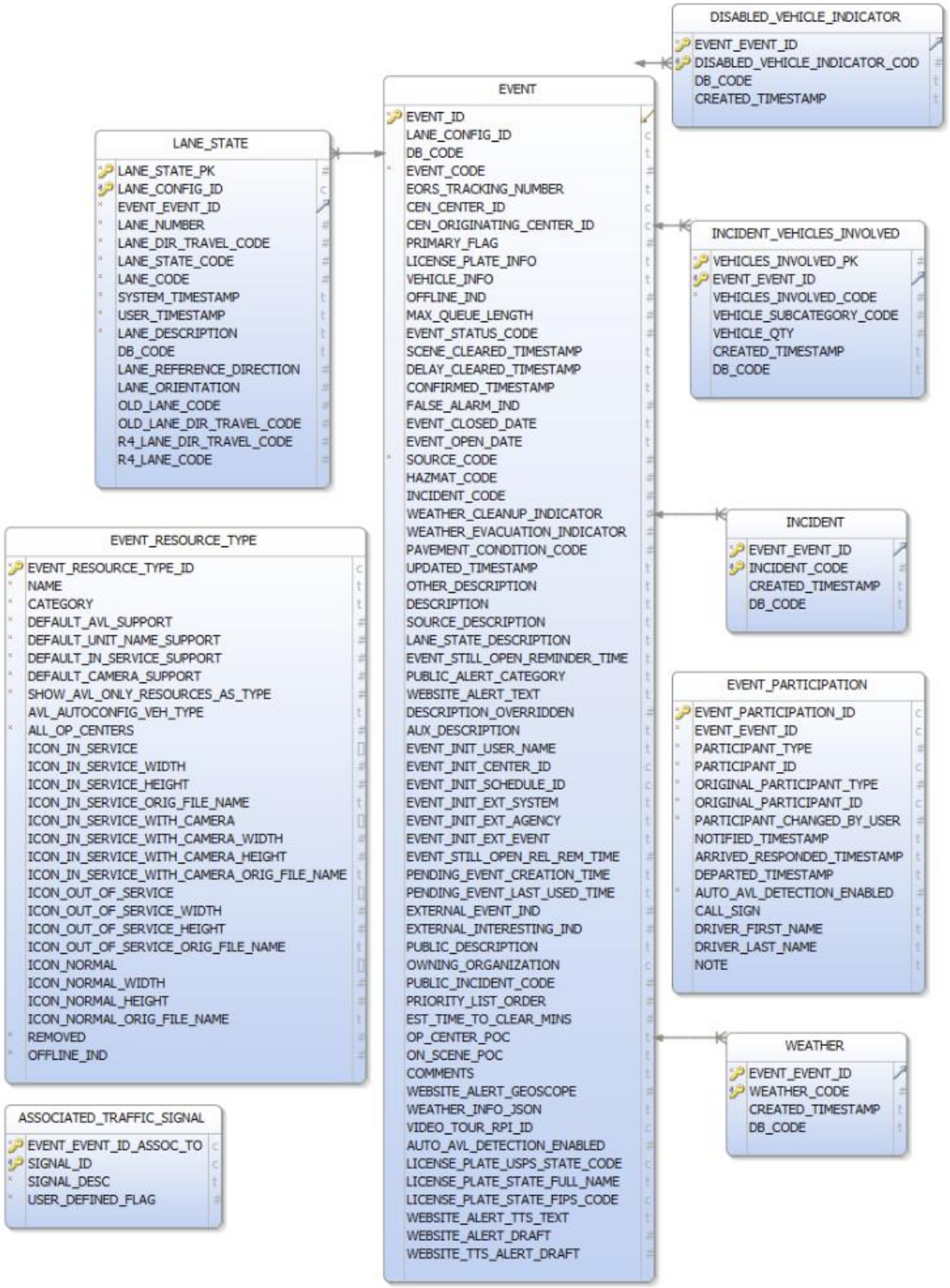


Figure 2-18. CHART_Archive ERD, Page 1-1

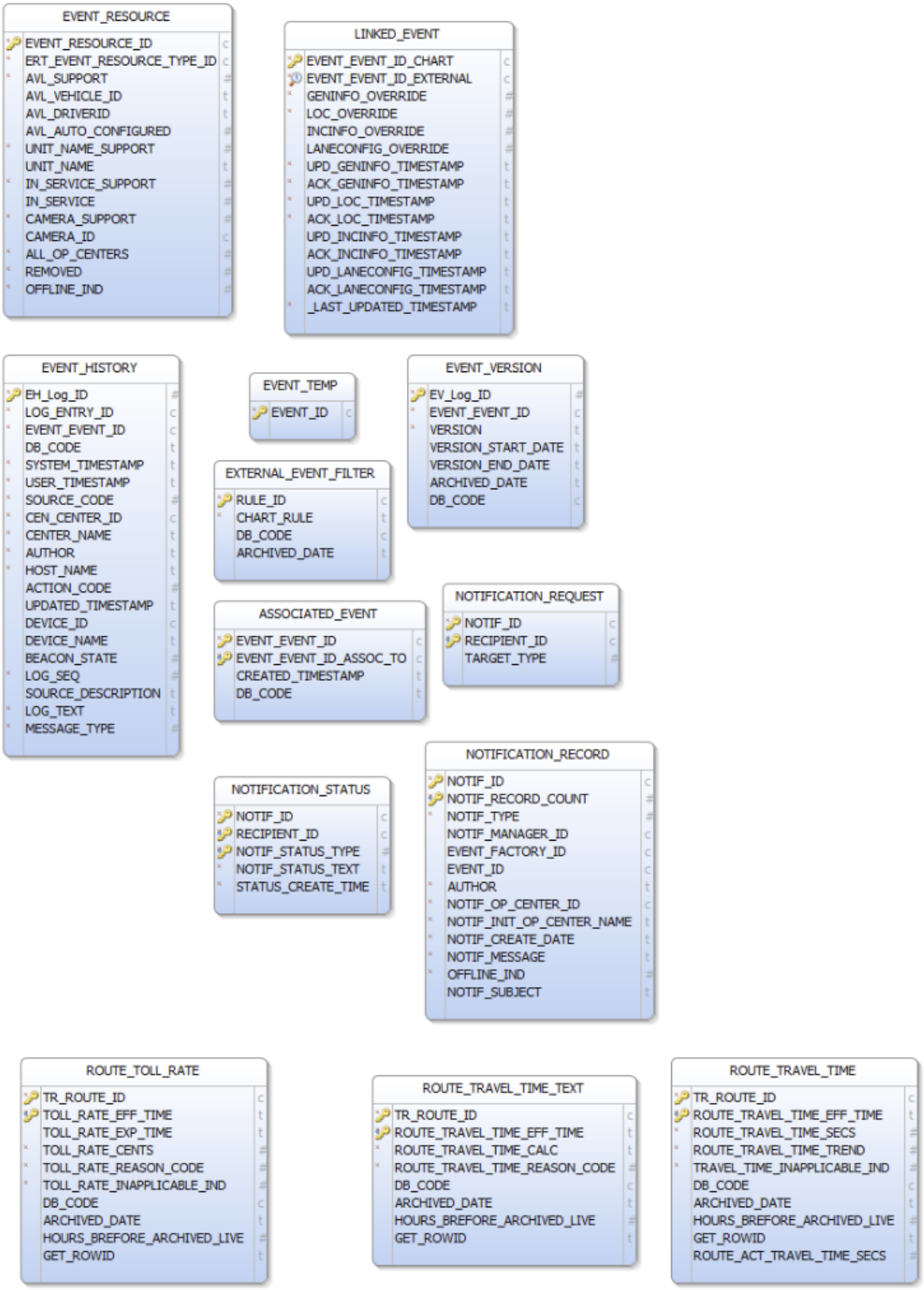


Figure 2-19. CHART_Archive ERD, Page 1-2

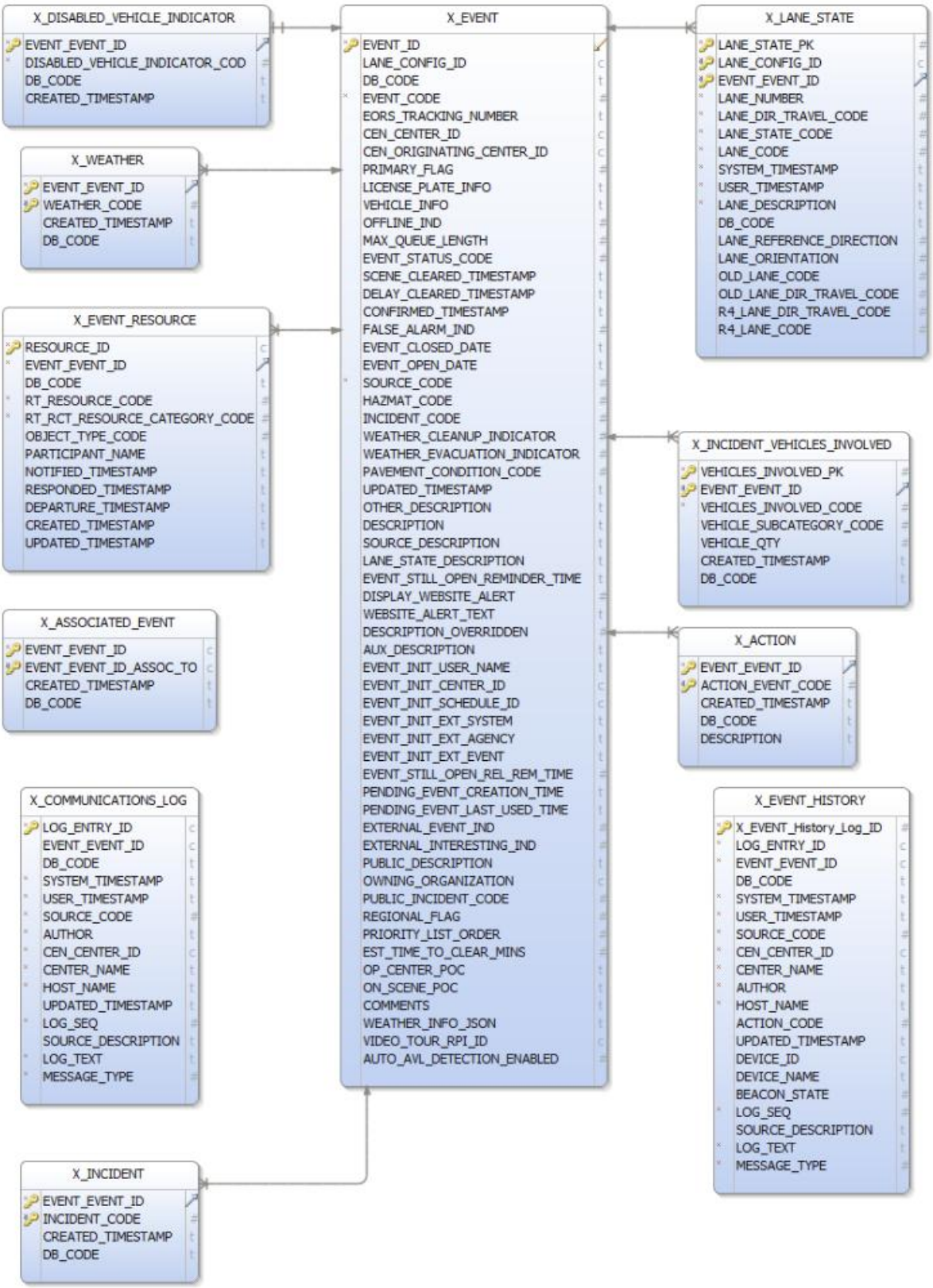


Figure 2-20. CHART_Archive ERD, Page 1-3

Figure 2-21. CHART_Archive ERD, Page 1-4

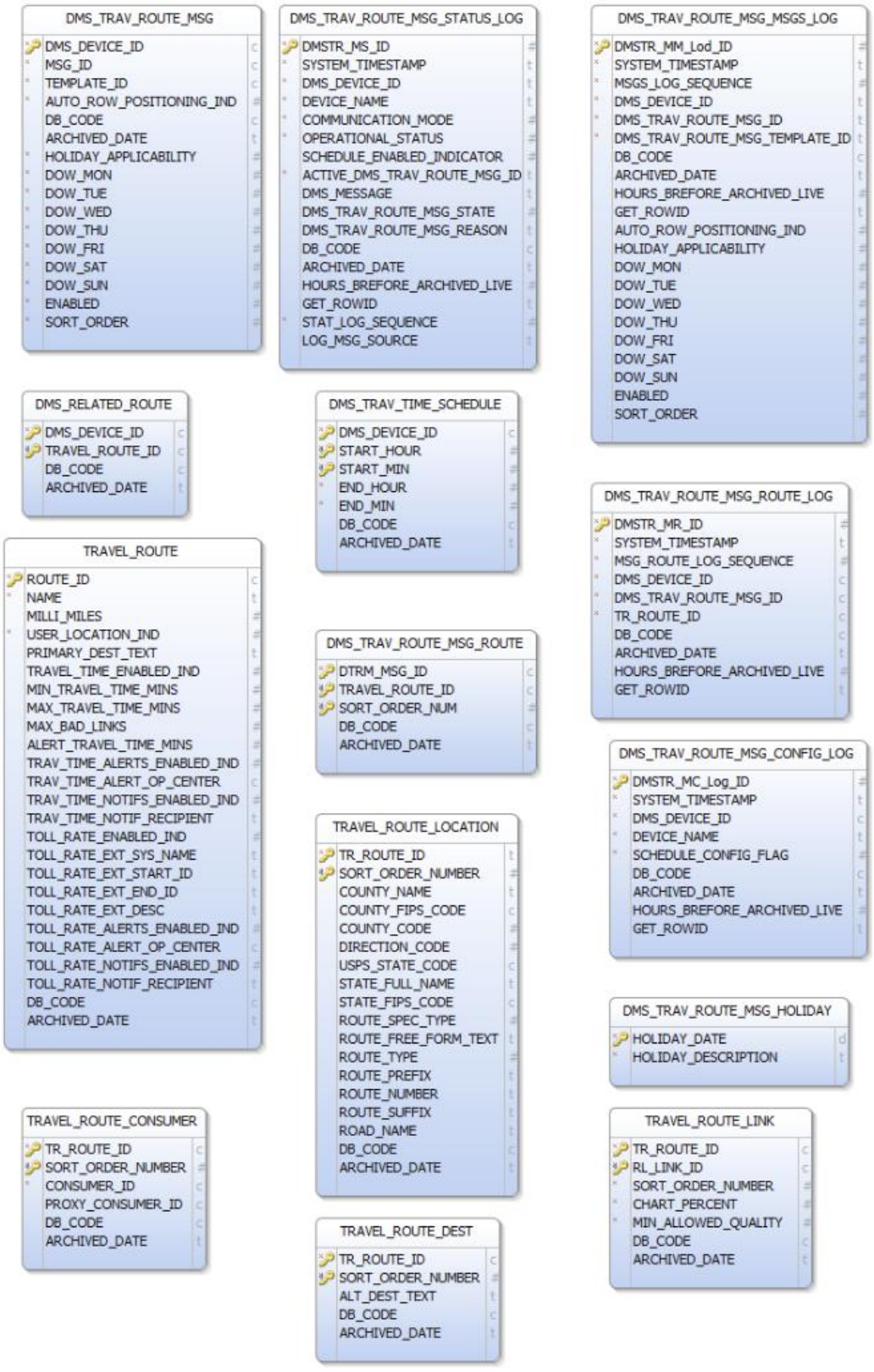


Figure 2-22. CHART_Archive ERD, Page 2-1

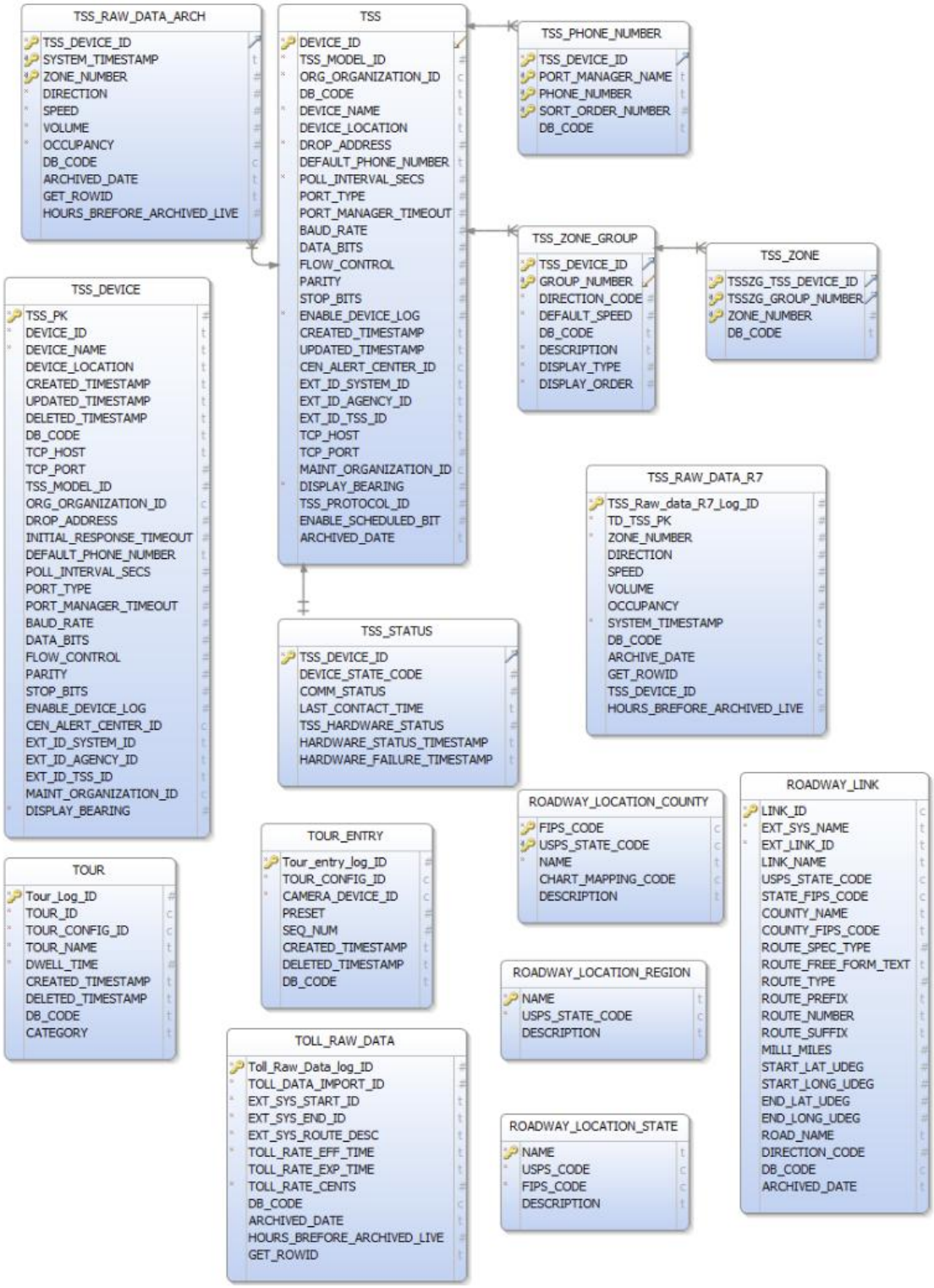


Figure 2-23. CHART_Archive ERD, Page 2-2

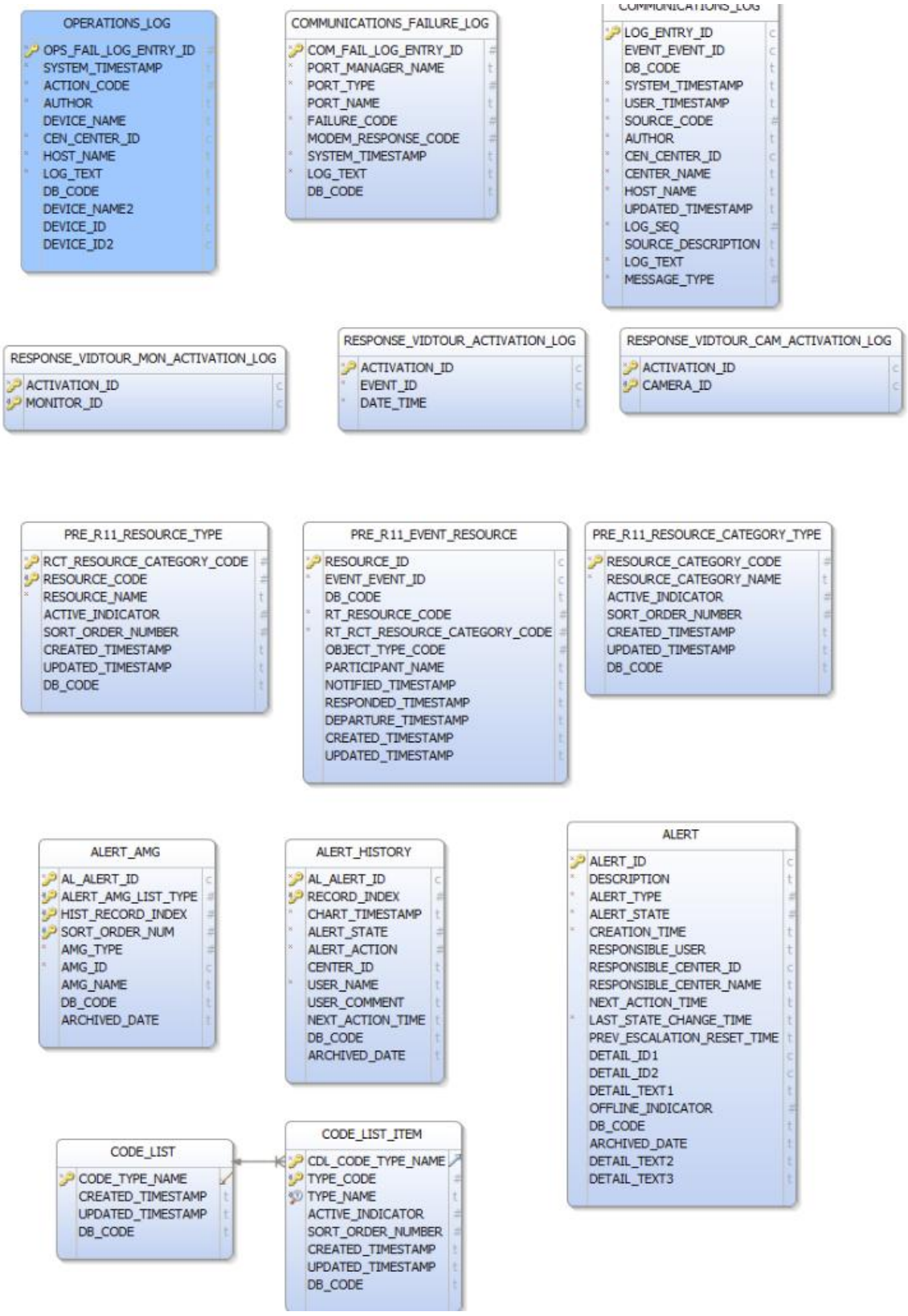


Figure 2-24. CHART_Archive ERD, Page 2-3

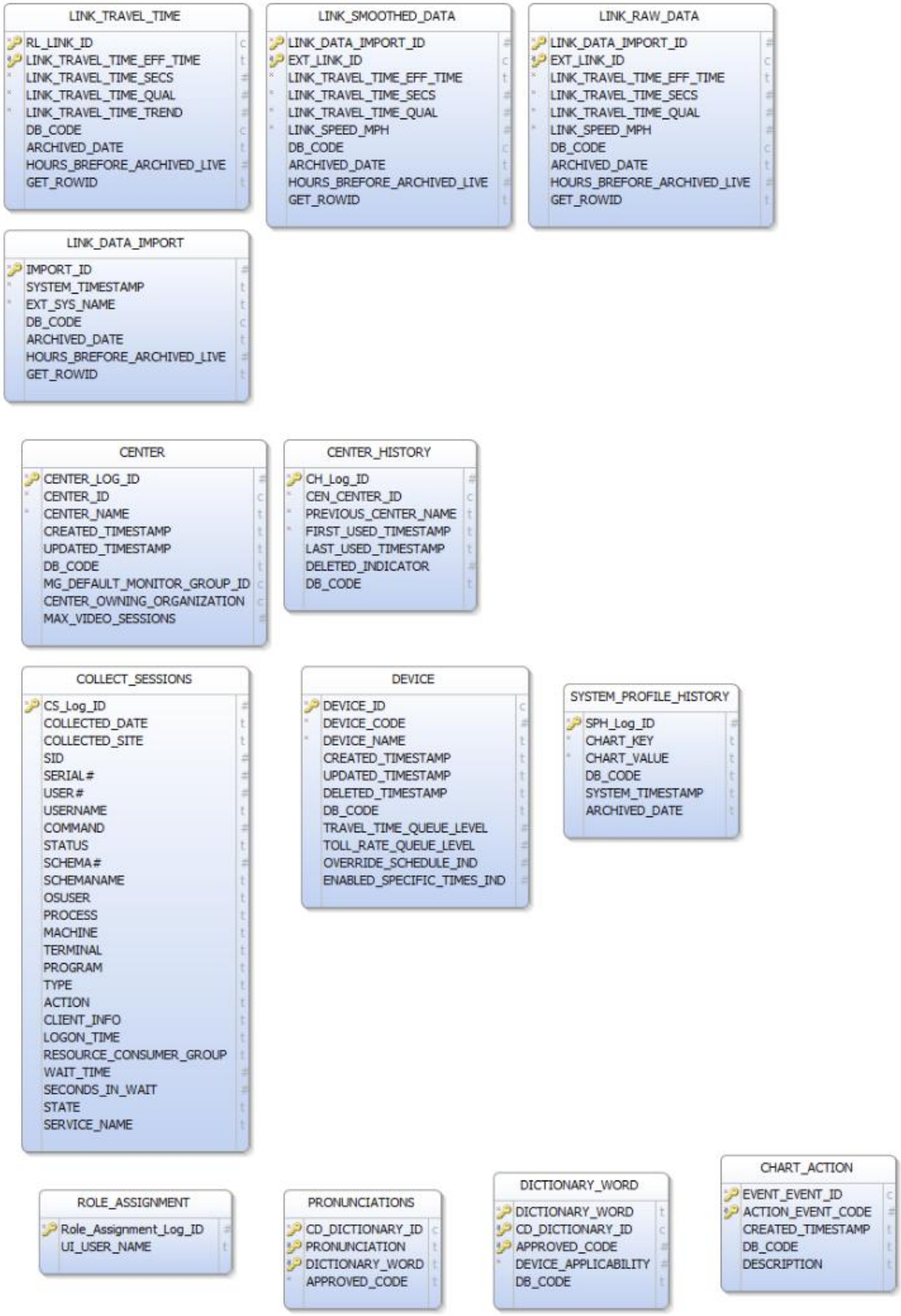


Figure 2-25. CHART_Archive ERD, Page 2-4

2.4.1.1.2.3 Function to Entity Matrix Report

The Create, Retrieve, Update, Delete (CRUD) matrix cross-references business functions to entities and shows the use of the entities by those functions. This report will be generated as part of the CHART O&M Guide.

2.4.1.1.2.4 Table Definition Report –

In tables shown below:

- Deleted columns/constraints marked with a minus sign ("-")
- Modified columns/constraints marked with an asterisk ("*")
- New columns/constraints marked with a plus sign ("+")

2.4.1.1.2.4.1 Database Changes for the Travel Time Enhancements Feature

2.4.1.1.2.4.1.1 CHART ATMS DB

The R12 Travel Time Enhancements feature requires one new table, modifications to two existing tables, and additional code list entries as specified in the sections below.

DMS_TRAV_ROUTE_MSG_HOLIDAY Table (New):
Rights: The DMSSERVICE user requires full C/R/U/D rights for this table.

This new table stores information about holidays that apply to messages in the DMS_TRAV_ROUTE_MSG table that specify that they apply to holidays or non-holidays.

DMS_TRAV_ROUTE_MSG_HOLIDAY Columns:

+HOLIDAY_DESCRIPTION	VARCHAR(512)	NOT NULL
+HOLIDAY_DATE	DATE	NOT NULL

PRIMARY KEY: HOLIDAY_DATE

ORGANIZATION Table (Modified):
Rights: No changes for R12

This table is modified to store a flag for each organization to indicate if travel time messages are enabled for that organization. (Note: there are other changes for the H.264 Video feature, listed here for completeness but described in that section, below.)

ORGANIZATION Columns:

ORGANIZATION_ID	CHAR(32)	NOT NULL	
ORGANIZATION_NAME	VARCHAR(128)	NOT NULL	
DB_CODE	VARCHAR(1)	NULL	
+ TRAVEL_TIME_MSGS_ENABLED	NUMERIC(1,0)	NOT NULL	DEFAULT(1)
+ IMPATH_H264_DECODER_USERNAME	VARCHAR(20)	NULL	

+ IMPATH_H264_DECODER_PASSWORD VARCHAR(20) NULL

PRIMARY KEY: ORGANIZATION_ID

DMS_TRAV_ROUTE_MSG Table (Modified):
Rights: No changes for R12.

This table is modified for R12 to add columns to store the holiday setting and day of week settings for each message.

DMS_TRAV_ROUTE_MSG Columns:

DMS_DEVICE_ID	CHAR(32)	NOT NULL	
MSG_ID	CHAR(32)	NOT NULL	
TEMPLATE_ID	CHAR(32)	NOT NULL	
AUTO_ROW_POSITIONING_IND	NUMERIC(1,0)	NOT NULL	
+HOLIDAY_APPLICABILITY	NUMERIC(1,0)	NOT NULL	DEFAULT 0
+DOW_MON	NUMERIC(1,0)	NOT NULL	DEFAULT 1
+DOW_TUE	NUMERIC(1,0)	NOT NULL	DEFAULT 1
+DOW_WED	NUMERIC(1,0)	NOT NULL	DEFAULT 1
+DOW_THU	NUMERIC(1,0)	NOT NULL	DEFAULT 1
+DOW_FRI	NUMERIC(1,0)	NOT NULL	DEFAULT 1
+DOW_SAT	NUMERIC(1,0)	NOT NULL	DEFAULT 1
+DOW_SUN	NUMERIC(1,0)	NOT NULL	DEFAULT 1
+ENABLED	NUMERIC(1,0)	NOT NULL	DEFAULT 0
+SORT_ORDER	NUMERIC(3,0)	NOT NULL	DEFAULT 0

PRIMARY KEY: DMS_DEVICE_ID, MSG_ID
FOREIGN KEY: DMS_DEVICE_ID

DMS_TRAV_ROUTE_MSG_STATUS_LOG Table (Modified):
Rights: No changes for R12.

This table is modified for R12 to change the name of the ENABLED_DMS_TRAV_ROUTE_MSG_ID column because R12 allows multiple travel route messages to be enabled, but only one active (which the data in this column represents). Note that while the column name change is shown as a deletion and an addition below, the name will simply be changed (using sp_rename) and all existing data will be preserved.

DMS_TRAV_ROUTE_MSG_STATUS_LOG Columns:

SYSTEM_TIMESTAMP	DATETIME2(0)	NOT NULL
STAT_LOG_SEQUENCE	NUMERIC(9, 0)	NOT NULL
DMS_DEVICE_ID	VARCHAR(32)	NOT NULL
DEVICE_NAME	VARCHAR(15)	NOT NULL
COMMUNICATION_MODE	NUMERIC (1, 0)	NOT NULL

OPERATIONAL_STATUS	NUMERIC (1, 0)	NOT NULL
SCHEDULE_ENABLED_INDICATOR	NUMERIC (1, 0)	NULL
-ENABLED_DMS_TRAV_ROUTE_MSG_ID	VARCHAR (32)	NOT NULL
+ACTIVE_DMS_TRAV_ROUTE_MSG_ID	VARCHAR (32)	NOT NULL
DMS_MESSAGE	VARCHAR (1024)	NULL
DMS_TRAV_ROUTE_MSG_STATE	NUMERIC (2, 0)	NULL
DMS_TRAV_ROUTE_MSG_REASON	VARCHAR (4000)	NULL
+LOG_MSG_SOURCE	VARCHAR (128)	NULL

PRIMARY KEY: DMS_DEVICE_ID, STAT_LOG_SEQUENCE, SYSTEM_TIMESTAMP

DMS_TRAV_ROUTE_MSG_MSGS_LOG Table (Modified):
Rights: No changes for R12.

This table is modified for R12 to add columns to log the additional configuration data added to traveler information messages for R12. A column is also added for the row positioning indicator, which was part of traveler information messages prior to R12 but was not being logged.

DMS_TRAV_ROUTE_MSG_MSGS_LOG Columns:

SYSTEM_TIMESTAMP	DATETIME2(0)	NOT NULL
MSGS_LOG_SEQUENCE	NUMERIC(7, 0)	NOT NULL
DMS_DEVICE_ID	VARCHAR(32)	NOT NULL
DMS_TRAV_ROUTE_MSG_ID	VARCHAR (32)	NOT NULL
DMS_TRAV_ROUTE_MSG_TEMPLATE_ID	VARCHAR (4000)	NOT NULL
+AUTO_ROW_POSITIONING_IND	NUMERIC (1, 0)	NULL
+HOLIDAY_APPLICABILITY	NUMERIC (1, 0)	NULL
+DOW_MON	NUMERIC (1, 0)	NULL
+DOW_TUE	NUMERIC (1, 0)	NULL
+DOW_WED	NUMERIC (1, 0)	NULL
+DOW_THU	NUMERIC (1, 0)	NULL
+DOW_FRI	NUMERIC (1, 0)	NULL
+DOW_SAT	NUMERIC (1, 0)	NULL
+DOW_SUN	NUMERIC (1, 0)	NULL
+ENABLED	NUMERIC (1, 0)	NULL
+SORT_ORDER	NUMERIC (3, 0)	NULL

PRIMARY KEY: SYSTEM_TIMESTAMP, MSGS_LOG_SEQUENCE,DMS_DEVICE_ID

FUNCTIONAL_RIGHT Table (Modified):
Rights: No changes for R12.

This table is modified for R12 to make the FR_NAME column longer.

DMS_TRAV_ROUTE_MSG_MSGS_LOG Columns:

FR_ID	NUMERIC(5,0)	NOT NULL
*FR_NAME	VARCHAR(50)	NOT NULL
FR_DESCRIPTION	VARCHAR(255)	NOT NULL
DB_CODE	VARCHAR (1)	NULL

PRIMARY KEY: FR_ID

CODE_LIST Table New Row:

CODE_TYPE_NAME
HolidayApplicability

CODE_LIST_ITEM Table New Rows:

CDL_CODE_TYPE_NAME	TYPE_ CODE	TYPE_NAME	ACTIVE_ INDICATOR
Action	81	Organization Config Changed	1
Action	82	System Configuration Changed	1
Action	83	DMS Trav Info Msg Action	1
HolidayApplicability	0	HolidaysOnly	1
HolidayApplicability	1	NonHolidaysOnly	1
HolidayApplicability	2	BothHolidaysAndNonHolidays	1
TravInfoMsgState	11	NO_MSG_ACTIVE	1

FUNCTIONAL_RIGHT Table New Row:

FR_ID	FR_NAME	FR_DESCRIPTION
151	Enable / Disable Travel Time Messages System Wide	Allows the holder to enable or disable travel time messages, system-wide, for organizations for which this right has been granted.

2.4.1.1.2.4.2 Database Changes for the CAD 911 Integration Feature

2.4.1.1.2.4.2.1 CHART ATMS DB

The R12 CAD 911 Integration feature requires one new table specified below.

LINKED_EVENT Table (New):
Rights: The TRAFFICEVENTSERVICE user requires full C/R/U/D rights for this table.

This new table stores information about linked events required to support linked events in CHART.

LINKED_EVENT Columns:

+EVENT_EVENT_ID_CHART	CHAR(32)	NOT NULL

+EVENT_EVENT_ID_EXTERNAL	CHAR(32)	NOT NULL
+GENINFO_OVERRIDE	NUMERIC (1, 0)	NOT NULL
+LOC_OVERRIDE	NUMERIC (1, 0)	NOT NULL
+INCINFO_OVERRIDE	NUMERIC (1, 0)	NULL
+LANECONFIG_OVERRIDE	NUMERIC (1, 0)	NULL
+UPD_GENINFO_TIMESTAMP	DATETIME2(0)	NOT NULL
+ACK_GENINFO_TIMESTAMP	DATETIME2(0)	NOT NULL
+UPD_LOC_TIMESTAMP	DATETIME2(0)	NOT NULL
+ACK_LOC_TIMESTAMP	DATETIME2(0)	NOT NULL
+UPD_INCINFO_TIMESTAMP	DATETIME2(0)	NULL
+ACK_INCINFO_TIMESTAMP	DATETIME2(0)	NULL
+UPD_LANECONFIG_TIMESTAMP	DATETIME2(0)	NULL
+ACK_LANECONFIG_TIMESTAMP	DATETIME2(0)	NULL
+_LAST_UPDATED_TIMESTAMP	DATETIME2(0)	NOT NULL

PRIMARY KEY: EVENT_EVENT_ID_CHART
UNIQUE CONSTRAINT: EVENT_EVENT_ID_EXTERNAL

2.4.1.1.2.4.3 Database Changes for the MD 511 Enhancements Feature

2.4.1.1.2.4.3.1 CHART ATMS DB

The R12 MD 511 Enhancements feature requires modifications to the EVENT table specified below, plus new CODE_LIST/CODE_LIST_ITEM values.

EVENT Table (Modified):
Rights: No changes for R12

This table is modified to store a text field for the web alert TTS text, geoscope value for the scope of impact of an event, and flags to indicate if the alert messages are drafts or are ready to be displayed to the public. R12 also replaces a generic public alert field with a more specific field that indicates which public group is to be alerted. **Note that the data in DISPLAY_WEBSITE_ALERT must be converted to a PUBLIC_ALERT_CATEGORY value before DISPLAY_WEBSITE_ALERT is dropped. Also REGIONAL_FLAG data must be converted to WEBSITE_ALERT_GEOSCOPE. See Database Conversion section below.**

EVENT Columns (not all columns are shown, for simplicity):

-REGIONAL_FLAG	NUMERIC(1,0)	NULL
+WEBSITE_ALERT_GEOSCOPE	NUMERIC(1,0)	NULL
-DISPLAY_WEBSITE_ALERT	NUMERIC(1,0)	NULL
+PUBLIC_ALERT_CATEGORY	VARCHAR(50)	NULL
+SCOPE_OF_IMPACT	NUMERIC(1,0)	NULL
+WEBSITE_ALERT_DRAFT	NUMERIC(1,0)	NULL

+WEBSITE_TTS_ALERT_DRAFT	NUMERIC(1,0)	NULL
WEBSITE_ALERT_TEXT	VARCHAR(3000)	NULL
+WEBSITE_ALERT_TTS_TEXT	VARCHAR(3000)	NULL

PRIMARY KEY: EVENT_ID

CODE_LIST Table New Values:

CODE_TYPE_NAME
Scope_Of_Impact

CODE_LIST_ITEM Table New Values:

CDL_CODE_TYPE_NAME	TYPE_CODE	TYPE_NAME	ACTIVE_INDICATOR
Scope_Of_Impact	0	Regional	1
Scope_Of_Impact	1	State	1
Scope_Of_Impact	2	County	1
Scope_Of_Impact	3	Route	1
Scope_Of_Impact	4	Event_Location	1

2.4.1.1.2.4.4 Database Changes for the Decision Support Routing Feature

2.4.1.1.2.4.4.1 CHART ATMS DB

The R12 Decision Support Routing feature requires modifications to two existing tables and additional code list entries as specified in the sections below.

CAMERA Table (Modified):
Rights: No changes for R12.

This table is modified for R12 to add the DS_ELIGIBLE column because R12 allows cameras to be configured for decision support.

CAMERA Columns:

DEVICE_ID	CHAR(32)	NOT NULL
CAMERA_MODEL_ID	NUMERIC(3, 0)	NOT NULL
ORG_ORGANIZATION_ID	CHAR(32)	NOT NULL
DEVICE_NAME	VARCHAR(50)	NOT NULL
LOCATION_PROFILE_TYPE	NUMERIC(3, 0)	NULL
LOCATION_PROFILE_ID	CHAR(32)	NULL
TMDD_CCTV_IMAGE	NUMERIC(2, 0)	NULL
CAMERA_NUMBER	NUMERIC(5, 0)	NULL
CAMERA_CONTROLLABLE	NUMERIC(1, 0)	NOT NULL
TMDD_CONTROL_TYPE	NUMERIC(2, 0)	NULL
TMDD_REQUEST_COMMAND_TYPES	NUMERIC(5, 0)	NOT NULL
ENABLE_DEVICE_LOG	NUMERIC(1, 0)	NOT NULL

	NO_VIDEO_AVAIL_INDICATOR	NUMERIC(1, 0)	NOT NULL
	DEVICE_LOCATION_DESC	VARCHAR(50)	NULL
	TMDD_DEVICE_NAME	VARCHAR(50)	NULL
	POLL_INTERVAL_CONTROLLED_SEC	NUMERIC(5, 0)	NULL
	POLLING_ENABLED_UNCONTROLLED	NUMERIC(1, 0)	NULL
	DEFAULT_CAMERA_TITLE	VARCHAR(24)	NULL
	DEFAULT_CAMERA_TITLE_LINE2	VARCHAR(24)	NULL
	CONTROL_CONNECTION_TYPE	NUMERIC(1, 0)	NULL
	CONTROL_CONNECTION_ID	CHAR(32)	NULL
	POLL_INTERVAL_UNCTRLD_SECS	NUMERIC(4, 0)	NULL
	DB_CODE	VARCHAR(1)	NULL
	CREATED_TIMESTAMP	DATETIME2(0)	NULL
	UPDATED_TIMESTAMP	DATETIME2(0)	NULL
	DSP_STATUS_ENABLED	NUMERIC(1, 0)	NULL
	DSP_STATUS_LENGTH	NUMERIC(5, 0)	NULL
	DISPLAY_CAMERA_ON_PUBLIC_MAP	NUMERIC(1, 0)	NULL
	DISPLAY_CAMERA_ON_INTRANET_MAP	NUMERIC(1, 0)	NULL
	MAINT_ORGANIZATION_ID	CHAR(32)	NULL
	SMNP_COMMUNITY_STRING	VARCHAR(30)	NULL
	HDLC_FRAME_REQUIRED	NUMERIC(1, 0)	NULL
	MINIMUM_PAN_SPEED	NUMERIC(3, 0)	NULL
	MAXIMUM_PAN_SPEED	NUMERIC(3, 0)	NULL
	MINIMUM_TILT_SPEED	NUMERIC(3, 0)	NULL
	MAXIMUM_TILT_SPEED	NUMERIC(3, 0)	NULL
	ZOOM_SPEED	NUMERIC(3, 0)	NULL
	FOCUS_SPEED	NUMERIC(3, 0)	NULL
	MIN_ZOOM_POSITION	NUMERIC(5, 0)	NULL
	MAX_ZOOM_POSITION	NUMERIC(5, 0)	NULL
+	DS_ELIGIBLE	NUMERIC(1, 0)	NULL

PRIMARY KEY: DEVICE_ID

DS_MSG_TEMPL_FILTER Table (Modified):
Rights: No changes for R12.

This table is modified for R12 to remove the proximity columns (i.e. columns starting with PROX_) because they are no longer needed. This table is also modified for R12 to add the MAX_TURNS_IN_ROUTE, UTURN_IN_ROUTE, and ROUTE_TYPE_IN_ROUTE columns because R12 allows decision support message templates to be configured for routing information.

DS_MSG_TEMPL_FILTER Columns:

MSG_TEMPLATE_ENTRY_ID	INT	NOT NULL
MSG_TEMPLATE_ID	CHAR(32)	NOT NULL

	FILTER_TYPE_ID	NUMERIC(2, 0)	NOT NULL
	EVENT_TYPE	NUMERIC(3, 0)	NULL
	DIST_TYPE	NUMERIC(2, 0)	NULL
-	PROX_SAME_ROUTE	NUMERIC(1, 0)	NULL
-	PROX_SAME_DIR	NUMERIC(1, 0)	NULL
-	PROX_SAME_DIR_UP	NUMERIC(1, 0)	NULL
-	PROX_SAME_DIR_DOWN	NUMERIC(1, 0)	NULL
-	PROX_OPP_DIR	NUMERIC(1, 0)	NULL
-	PROX_OPP_DIR_UP	NUMERIC(1, 0)	NULL
-	PROX_OPP_DIR_DOWN	NUMERIC(1, 0)	NULL
-	PROX_OTHER_ROUTE	NUMERIC(1, 0)	NULL
	MAX_COLUMNS	NUMERIC(2, 0)	NULL
	TEMPLATE_TYPE	NUMERIC(3, 0)	NOT NULL
-	PROX_OTHER_ROUTE_UP	NUMERIC(1, 0)	NULL
-	PROX_OTHER_ROUTE_DOWN	NUMERIC(1, 0)	NULL
+	MAX_TURNS_IN_ROUTE	NUMERIC(2, 0)	NULL
+	UTURN_IN_ROUTE	NUMERIC(1, 0)	NULL
+	ROUTE_TYPE_IN_ROUTE	NUMERIC(2, 0)	NULL

PRIMARY KEY: MSG_TEMPLATE_ENTRY_ID

DS_MSG_TEMPL_FILTER_TYPES Table New Values:

FILTER_TYPE_ID	DESCRIPTION
5	Max Number of Turns in Route Filter
6	Allow U-turns in Route Filter
7	Supported Route Types in Route Filter

2.4.1.1.2.4.5 Database Changes for the H.264 Video Feature

2.4.1.1.2.4.5.1 CHART ATMS DB

The R12 H.264 Video feature requires modifications to one existing table and additional code list entries as specified in the sections below.

ORGANIZATION Table (Modified):
Rights: No changes for R12

This table is modified to store credentials for each organization to use when commanding H.264-capable Impath decoders for that organization. (Note: there are other changes for the Travel Time Enhancements feature, listed here for completeness but described in that section, above.)

ORGANIZATION Columns:

ORGANIZATION_ID	CHAR(32)	NOT NULL
ORGANIZATION_NAME	VARCHAR(128)	NOT NULL
DB_CODE	VARCHAR(1)	NULL

+ TRAVEL_TIME_MSGS_ENABLED NUMERIC(1,0) NOT NULL DEFAULT(1)
+ IMPATH_H264_DECODER_USERNAME VARCHAR(20) NULL
+ IMPATH_H264_DECODER_PASSWORD VARCHAR(20) NULL

CODE_LIST_ITEM Table New Values:

CDL_CODE_TYPE_NAME	TYPE_ CODE	TYPE_NAME	ACTIVE_ INDICATOR
Codec Type	2	Impath VSG 1000 (MPEG-2)	1
Codec Type	3	Impath i5110 (H.264)	1
Codec Type	4	Impath 5K-series (H.264)	1

2.4.1.1.2.4.6 Database Changes for PR Fixes to be Included in R12

2.4.1.1.2.4.6.1 Issue #6152

This PR attempts to combine routes with multiple suffixes (for instance, the 9 routes for MD 648, which have suffixes: A, AA, AB, D, E, F, G, H, and I).

SYSTEM_PROFILE Table New Row:

CHART _KEY	CHART_VALUE
chartlite.routeNumbersWithImportantSuffixesJSON	chartlite.routeNumbersWithImportantSuffixesJSON','[{"num":"40","sfx":"AL","pfx":"US"},{"num":"29","sfx":"A","pfx":"US"},{"num":"948","sfx":"AL","pfx":"MD"},{"num":"404","sfx":"AL","pfx":"MD"},{"num":"144","sfx":"AL","pfx":"MD"},{"num":"1","sfx":"AL","pfx":"US"}]

2.4.1.1.2.4.6.2 Issue #6169

This PR adds a state field for vehicle license plate for disabled vehicle events.

EVENT Table (Modified):
Rights: No changes for R12

This table is modified to store state information for disabled vehicle events.

EVENT Columns:

+ LICENSE_PLATE_USPS_STATE_CODE CHAR(2) NULL
+ LICENSE_PLATE_STATE_FULL_NAME VARCHAR(32) NULL
+ LICENSE_PLATE_STATE_FIPS_CODE CHAR(2) NULL

PRIMARY KEY: EVENT_ID

2.4.1.1.2.4.6.3 Issue #6219

This PR adds a checkbox for potholes for an Action Event.

CODE_LIST_ITEM Table New Values:

CDL_CODE_TYPE_NAME	TYPE_ CODE	TYPE_NAME	ACTIVE_ INDICATOR
Action Event	25	Pothole	1

2.4.1.1.2.5 Database Conversion

Prior to R12, only one message for each DMS in the DMS_TRAV_ROUTE_MSG table could be enabled, and that was determined by the DMS_STATUS.TRAV_MSG_ID field. That field would contain the ID of the message that was enabled. In R12, multiple messages can be enabled, and the new field DMS_TRAV_ROUTE_MSG.ENABLED is used to indicate which are enabled. While multiple messages can be enabled, only one message can be the active message; each message's holiday and day of week settings in addition to the sort order are used to determine which of the enabled messages is active. So the existing DMS_STATUS.TRAV_MSG_ID field will be used to indicate the ***Active*** message rather than the enabled message. When an R11 CHART ATMS database is converted for use by R12, the DMS_TRAV_ROUTE_MSG.ENABLED field will be initialized to zero (disabled) for all existing messages. A database conversion script will be needed to then set DMS_TRAV_ROUTE_MSG.ENABLED to one (enabled) where DMS_TRAV_ROUTE_MSG.MSG_ID exists in the DMS_STATUS.TRAV_MSG_ID column. This will cause all messages that were enabled (and active) when R11 is shut down to be enabled (and active) when R12 is started for the first time following deployment.

With the switch of REGIONAL_FLAG to WEBSITE_ALERT_GEOSCOPE, the following conversion must take place before REGIONAL_FLAG is deleted:
Set WEBSITE_ALERT_GEOSCOPE to 0 (Regional) where REGIONAL_FLAG = 1 (true).
Set WEBSITE_ALERT_GEOSCOPE to 4 (Event_Location) where REGIONAL_FLAG = 0.

With the replacement of the generic DISPLAY_WEBSITE_ALERT in the EVENT table with the more specific PUBLIC_ALERT_CATEGORY field, all active events will need to be converted before DISPLAY_WEBSITE_ALERT is deleted:
Events where DISPLAY_WEBSITE_ALERT is true will set PUBLIC_ALERT_CATEGORY to "General".
Events where DISPLAY_WEBSITE_ALERT is false or null will set PUBLIC_ALERT_CATEGORY to "None".

2.4.1.1.2.6 PL/SQL Module Definition and Database Trigger Reports

There are no new PL/SQL modules for CHART ATMS R12.

2.4.1.1.2.7 Database Size Estimate - provides size estimate of current design

CHART ATMS R12 will cause an increase in the size of the CHART ATMS database as follows:

- The number of holidays defined in the new DMS_TRAV_ROUTE_MSG_HOLIDAY table should be on the order of 10 to 20, as the plan discussed during JADs was to keep the same holiday list from year to year, updating the dates as appropriate.
- There are approximately 100 rows in the DMS_TRAV_ROUTE_MSG table, so the additional columns added to that table should not have a significant impact.
- The ORGANIZATION table has just over 100 rows and the additional column should have no significant impact.
- We will be adding a new travel time data source, and the INRIX Import Service, which imports the travel time data, logs all raw data it receives. The plan is for the MDTA Travel Time service to provide us with 2 additional links, one northbound and one southbound for the section of roadway that contains HOT lanes. This will amount to 2 additional rows approximately every 2 minutes in the following tables: LINK_DATA_IMPORT, LINK_RAW_DATA, and LINK_SMOOTHED_DATA. Additionally, the LINK_TRAVEL_TIME table will have 2 additional rows for the current travel time for each of the 2 new links. If MDTA provides more than 2 links (which is the preliminary plan, the number of rows added to these tables will increase).
- Additional logging will be added for some of the user operations related to traveler information messages for DMSs, such as enabling and disabling messages and changing the message order/priority. This will lead to additional rows being added to the OPERATIONS_LOG table, although these operations are not very frequent so the increase should be minimal.
- The LINKED_EVENT table will contain one row for each open linked traffic event pair. The number of linked events will not be large to there should be no significant impact on DB size.
- The CAD integration should not account for a great number of CHART traffic events (internal events) being created in CHART since for all intents and purposes the CAD integration will only be doing in a more automated fashion what the operators do already. There should be no significant impact.
- The number of External Traffic Events will increase since we are adding a new source of external event data (CAD). This will depend on event import rules as well. Hard to determine the impact at this time, however, we do have a configuration setting that limits the number of external events allowed in the system at one time to 300.
- The CAMERA table has almost 800 rows and the additional column should have no significant impact.
- The DS_MSG_TEMPL_FILTER table has over 100 rows and the additional columns should have no significant impact.
- The DS_MSG_TEMPL_FILTER_TYPES table has 4 rows and the additional 3 rows will have no impact.
- All of the new fields in the Event table are small except one and that one is expected to rarely be populated so there should be no noticeable impact.

2.4.1.1.2.8 Data Distribution

There are no changes to data distribution for R12.

2.4.1.1.2.9 Database Replication

Database replication is not used in R12. If it were to be desired to run multiple instances of the DMS Service, the DMS_TRAV_ROUTE_MSG_HOLIDAY table would need to be replicated, and code changes would be needed to allow the Chart2DMSFactory objects inside the DMS service to keep their list of holidays in synch.

2.4.1.1.2.10 Database Failover Strategy

The database failover strategy is defined as part of Work Order 27. There are no changes to the database failover strategy for R12.

2.4.1.1.2.11 Reports

No reports will be added or updated for R12. Since R5, the CHART reporting function has been transferred to University of Maryland.

2.4.1.2 CHART Flat Files

The following describes the use of flat files in CHART ATMS.

2.4.1.2.1 Service Registration Files

A new instance of the INRIX Import Service is added for CHART ATMS R12. It will have a new service registration file as part of the R12 deployment.

2.4.1.2.2 Service Property Files

The new instance of the INRIX Import Service added for CHART ATMS R12 will have its own service property file, which will be nearly identical to the service property file that exists for the current INRIX Import Service, except the name of the data provider will be changed so we can know data imported from this new instance is from the MDTA Travel Time service, and the connection information will be updated to point to the MDTA Travel Time service instead of INRIX.

2.4.1.2.3 GUI Property Files

There are only minor updates to the GUI properties file in its WEB-INF directory for CHART ATMS R12.

2.4.1.2.4 Device Logs

There are no changes to Device Log Files for CHART ATMS R12.

2.4.1.2.5 Service Process Logs

All CHART ATMS services write to a process log, used to provide a historical record of activity undertaken by the services. These logs are occasionally referenced by software engineering personnel to diagnose a problem or reconstruct a sequence of events leading to a particular

anomalous situation. These logs are automatically deleted by the system after a set period of time defined by the service's properties file, so they do not accumulate infinitely. These files are stored in the individual service directories and are named by the service name and date, plus a "`.txt`" extension. These logs are typically read only by software engineering personnel. Except where noted, there are no changes for service process logs for R12 features.

2.4.1.2.6 Service Error Logs

All CHART ATMS services write to an error log, used to provide detail on certain errors encountered by the services. Most messages, including most errors, are captured by the CHART ATMS software and written to the process logs, but certain messages (typically produced by the Java Virtual Machine itself, by COTS, or DLLs) cannot be captured by CHART ATMS Software and instead are captured in these "catch-all" logs. Errors stored in these logs are typically problems resulting from a bad installation; once the system is up and running, errors rarely appear in these error logs. Debugging information from the JacORB COTS, which is not usually indicative of errors, can routinely be found in these error logs, as well. These log files can be reviewed by software engineering personnel to diagnose an installation problem or other type of problem. These logs are automatically deleted by the system after a set period of time defined by the service's properties file, so they do not accumulate infinitely. These files are stored in the individual service directories and are named by the service name and date, plus an ".err" extension. These logs are typically read only by software engineering personnel. Except where noted, there are no changes for service error logs for R12 features.

2.4.1.2.7 GUI Process Logs

Like the CHART background services, the CHART ATMS GUI service also writes to a process log file, used to provide a historical record of activity undertaken by the process. These GUI process logs are occasionally referenced by software engineering personnel to diagnose a problem or reconstruct a sequence of events leading to a particular anomalous situation. These logs are automatically deleted by the system after a set period of time defined by the GUI service's properties file, so they do not accumulate infinitely. These files are stored in the `chartlite/LogFiles/` directory under the `WebApps/` directory in the Apache Tomcat installation area. They are named by the service name ("`chartlite`") and date, plus a "`.txt`" extension. These logs are typically read only by software engineering personnel. Additional log files written by the Apache Tomcat system itself are stored in the `log/` directory in the Apache Tomcat installation area.

- The CHART ATMS R12 GUI changes do not change the way the GUI process logs operate.

2.4.1.2.8 FMS Port Configuration Files

The CHART ATMS Communications Services read a Port Configuration file, typically named `PortConfig.xml`, upon startup, which indicates which ports are to be used by the service and how they are to be initialized. A Port Configuration Utility is provided which allows for addition, removal of ports and editing of initialization parameters. As indicated by the extension, these files are in XML format. This means these files are hand-editable, although the Port

Configuration Utility allows for safer, more controlled editing. The Port Configuration files are typically modified only by software engineers or telecommunications engineers.

- There are no changes to this section for the any of the CHART ATMS R12 features.

2.4.1.2.9 Watchdog Configuration Files

The watchdog configuration files are changed for CHART ATMS R12 to cause the watchdog to monitor the second instance of the INRIX import service.

2.4.2 Database Design

Changes made to the CHART ATMS database design for Release 12 features are described below.

2.4.2.1 CHART ATMS DB

2.4.2.1.1 Travel Time Enhancements

The R12 Travel Time Enhancements feature will require one new table, require changes to four existing tables, require some new code list entries, and one new functional right. See the details described in section 2.4.1.1.2.4.1 above.

2.4.2.1.2 CAD 911 Integration

The R12 CAD 911 Integration feature will require one new table. See the details described in section 2.4.1.1.2.4.1 above.

2.4.2.1.3 MD511 Integration

The R12 MD511 Integration feature will require changes to one existing table. See the details described in section 2.4.1.1.2.4.1 above.

2.4.2.1.4 Decision Support Routing

The Decision Support Routing feature will require changes to two existing tables. See the details described in section 2.4.1.1.2.4.1 above.

2.4.2.1.5 H.264 Video

The H.264 Video feature will require changes to one existing table. See the details described in section 2.4.1.1.2.4.1 above.

2.4.2.2 Archiving - Changes

The CHART ATMS Archive database stores data from the CHART operational system as part of a permanent archive. The CHART ATMS Archive database design is a copy of the CHART ATMS operational system for those tables containing system, alert, traveler information messages and their underlying data, and event log information. In addition, the CHART ATMS Archive database stores detector data. In R12, the archive will be changed to include the new

table and new columns added to existing tables for the Travel Time Enhancements as specified in section 2.4.1.1.2.4.1 above.

3 Key Design Concepts

3.1 Travel Time Enhancements

The travel time enhancements involve design changes in several different areas as follows.

To support the ability to enable or disable traveler information messages system-wide per organization, the existing CORBA Organization interface will be modified to add a new flag for this purpose. To support this new flag, the Organization interface will be changed to include a configuration structure that will contain the existing name field in addition to this new flag. CORBA event changes accompany this change so the GUI can be notified when this field changes for any organization. Note that while the Name field is part of the configuration, there is no screen in CHART ATMS that allows the name of an organization to be changed, and such functionality is outside the scope of R12. The name is being included in the configuration to be consistent with other configuration structures that exist in CHART ATMS and the configuration structure also provides a framework for adding other attributes for organizations in the future.

Traveler information message holidays will be managed via the Chart2DMSFactory, for their only use is within the Chart2DMSImpl objects, hosted by the Chart2DMSFactory. These holidays are a simple list of date/name pairs that will be cached in the factory and persisted in the database. A new CORBA event will be added to the DMS control channel to allow the CHART ATMS GUI to be notified when the list of holidays changes.

Traveler information messages are being changed to include several new attributes. An enabled flag is added to each message to allow more than one message to be enabled on a DMS, while only one may be the active message. Holiday and day of week settings will be used to determine which of the enabled messages (if any) should be the active message. A sort order setting is added so the traveler information messages can be set in a specific order that is used to define the precedence of each message in the case that two enabled traveler information messages could be active at the same time, in which case the highest priority message will be considered the active message. The determination of which traveler information message is active will be based solely on whether or not a message is enabled, its holiday applicability setting, its day of week settings, and the sort/precedence order. There are a number of conditions that can prevent the active message from being displayed, such as the travel time display schedule of a DMS, and data availability for the tags contained within the message template. CHART ATMS will not attempt to change the active message for a DMS based on any of these other factors. The existing message status and reason fields will continue to be used to indicate why the active message is not currently displayed in these instances. It was determined the system should not automatically choose a different message to be active in these instances because the system cannot determine if the content of the next enabled message is appropriate; the user must determine that. If desired, the user could disable a message that is not being displayed due to missing or old data to have another message become the active message. Note that these new features for traveler information messages are designed to meet requirements of travel time messages however these features can be used for toll rate messages also if desired.

The new Travel Time Summary page will be implemented using the existing dynamic list framework that exists in the CHART ATMS GUI. Several new filters will be added to support

columns such as the current message and queued messages where the text of the column alone cannot be used as a filter. These custom filters will allow this new page to fulfill its main purposes, which are to allow a user to quickly determine when travel time signs are not displaying travel times, and to determine if a message on the DMS arbitration queue exists that would be better suited for display than the message that is currently displayed.

CHART ATMS R12 will connect to a new source for travel time data, the MDTA Travel Time System. CHART ATMS will continue to retrieve travel times from the INRIX system, however the new data source will provide additional travel time data for high occupancy toll lanes. To facilitate the import of this new travel time data, a second instance of the INRIX import service will be deployed. This service was designed to allow for the source of the data to be specified in the configuration file, so with configuration-only changes, this service should be suitable to connect to the new MDTA Travel Time System, which will emulate the system interface provided by the INRIX system. The existing CHART ATMS Travel Route Service was designed to support multiple data sources; therefore, design changes are not required in that service either. Although the design of both the INRIX Import Service and the Travel Route Service planned to support multiple travel time data sources, proof of concept testing discovered several minor coding errors that prevent that feature from fully working as designed. These errors will be corrected as part of the R12 implementation phase, and the R12 integration test will be the first time this design for multiple travel time sources will be formally tested, as multiple data sources were not available when the travel time feature was first implemented.

3.2 CAD 911 Integration

The CAD 911 Integration enhancement involves design changes in several different areas as follows.

To support the ability to link an external event to a CHART event the IDL is modified to allow a one to one relationship between linked events (one external event and one CHART event). A new CHART event can be created using data from an external event which automatically “links” the newly create CHART event to the external or an existing CHART event can be linked to an existing external event (must be the same type).

The TrafficEventFactoy is responsible for creating Linked CHART Events or linking and existing CHART event to an existing external. In this case neither event can currently be linked to other events. Factory enforces that an external event can only be linked to a CHART event and vice versa. Linked events can be unlinked at any time. The TrafficEventFactory is also responsible for unlinking events. TrafficEventFactory IDL interface is changed to support these features.

After receiving updated information from the RITIS service, an external event in the TrafficEventService (represented by TrafficEventImpl/TrafficEventGroup object) forwards the updated information to its linked CHART event if it exists. The communication happens internal to the TrafficEventService (not CORBA) since all traffic events are now contained within the same service. The linked CHART event then determines if any changes are warranted based on comparison with its current state and also its current linked event section override settings and updates itself using existing update methods if needed.

For linked CHART events, certain sections of event data can be supplied by the external event or by an operator. These are called Linked Event Sections. The information that can be supplied by the external event for each linked event section is documented in the Traffic Event Import ICD. The linked event sections are: General Event Information, Event Location, Incident Information, and Lane Configuration. When a user edits data in one of the linked event sections the section is considered overridden and future external updates for that section will be ignored. An operator can choose to use external event updates for a section at any time.

When a linked CHART event's underlying external data is updated, operators are made aware of it through visual cues added to the Event Details page and the Operations Center Report, Open Events and Open/Closed Events lists and the Home Page Event list. On the Event Details page the update indicators are on a per linked event section basis. The indicators can be turned off for each linked data section using the System Profile Properties pages.

In addition to the above changes to the Operations Center Report, Open Events and Open/Closed Events lists and the Home Page Event list, these are also modified to now include external events within a user's areas of responsibility that have been marked as interesting either on event import or by an operator.

3.3 MD 511 Integration

The MD 511 enhancements involve design changes in several different areas as follows.

To support the additional geo-scope setting, web alert audio text, public alert category, and indicator fields for a CHART Event the IDL will be modified to include these fields within the Basic Event Details. On the Traffic Event General Info page, the regional flag will be converted to a geoscope enumeration with the following selectable values: Region, State, County, Route, and Event Location (default). The display website traffic alert flag will be converted from a Boolean to a string so it can contain any one of a configurable set of categories initially expected to be: None (default), General, Amber/Silver Alert, and Commercial Vehicle Operations. The TrafficEventReqHdlr will be modified to support these additional fields within the basic traffic event data.

The General Info page will include a web alert audio text field where operators can provide an optional text to speech version of the generic public message for MD 511. Indicator flags for the web alert text and the web alert text to speech text will indicate whether either text field are in draft state (i.e.: not ready for public display) or in publish state. An update to the ExportListenerModule.TrafficEvent will evaluate if the web alert text field is not in a draft state before making the alert text available to CHARTWeb along with the basic traffic event data.

The web alert audio text field on the General Info page can also be previewed by an operator as text to speech using the asynchronous play text methods of the HarReqHdlr. The text in this field can be substituted for Audio Pronunciations using the TTS PronunciationList methods of the DictionaryReqHdlr. The General Info page will also be modified to copy text data from the web alert text field to the web alert audio field so it is convenient for an operator to customize the alert for TTS.

3.4 Decision Support – Routing

The decision support routing enhancements involve design changes in several different areas as follows.

To support the new routing information that will be available from the mapping web service in R12, the existing CORBA Decision Support interface will be modified to add information about the route including: the length of the route (in miles), the number of turns in the route, whether the route contains a U-turn, the coordinates of the route, and the driving directions for the route. This route information will be incorporated into the existing Suggestion Data CORBA objects for use in making response suggestions. All route information will be obtained from the mapping web service and managed by the Traffic Event service.

Decision support message templates are being changed to include several new route related settings including: the maximum number of turns in the route that are supported by the template, whether the template supports a U-turn in the route, and the route types in the route that are supported by the template. The Message Utility service has been modified to handle the new route settings in the message templates. In the GUI, the DMS and HAR template editors (available via the System Profile pages) have been modified to include the new route related settings.

The Decision Support System Profile Properties pages are being changed to add route related settings. A user can configure route settings for each type of device (DMS, HAR, and camera) that is eligible for decision support suggestions. The new route related settings include: the maximum number of turns allowed in the route, whether a U-turn is allowed in the route, and the route types that are allowed in the route. These route settings are used by the Traffic Event service to determine whether a device should be suggested for the response plan of a traffic event.

A new Suggestions Map is being added to the Decision Support Suggestions page in the GUI. When a user requisitions suggestions for the response plan of a traffic event, the resulting device suggestions can now be viewed on the Suggestions Map. A user can also view the route from each suggested device to the traffic event. A user preference setting is also being added to the Suggestions page that will allow a user to indicate whether the default view for the Suggestions page should be the lists view or the map view.

To support the ability to configure cameras as decision support eligible or ineligible, the existing CORBA Camera Control interface will be modified to add a new flag for this purpose. The camera details page and the camera configuration page in the GUI have been changed to allow a user to set the decision support eligible flag for a camera. If a camera is configured to be eligible for decision support, it will be considered when suggestions are requested for a traffic event response plan.

3.5 H.264 Video

The H.264 Video enhancement adds one new type of encoder and two new types of decoders, all manufactured by Impath Networks. The new encoder is the Impath i5110-E, a standalone single encoder. The new decoders are the Impath i5110-D, a standalone single encoder, and two other encoder models which operate under the same API, and therefore can be treated as one type of

decoder within the CHART ATMS. These are the Impath VSG 5280-D and the VSG 5000-D. These are referred to collectively within the CHART ATMS as Impath 5K-series decoders. The VSG 5280-D is a unit which contains 8 separate decoders. It is expected to be used at the TOCs. The VSG 5280-D has one Ethernet connection, but each of the 8 decoders in the unit is separately IP addressable, each has its own video output for connection to a monitor, and each can be (and is) considered as a standalone decoder within the ATMS. The VSG 5000-D is a chassis-based card-cage type unit, with 13 slots. Each slot can hold an 8-port decoder unit which is functionally equivalent to one VSG 5280-D, with one Ethernet port, 8 video outputs, and 8 IP addresses. Each port on each card, therefore can be (and is) considered as a standalone decoder within the ATMS. One VSG 5000-D is expected to be used within the CHART ATMS, at the SOC. The i5110-D has an API, and VSG 5K-series decoders all share an API which is different from the i5110-D API, therefore the i5110-D and 5K-series decoders must be treated as distinct types of decoders within the ATMS. All of these decoders are capable of decoding H.264 video from an i5110-E encoder.

Although these new CODECs are capable of handling multiple compression types, within CHART ATMS R12, only H.264 compression is supported. Due to the looseness of various compression standards, it is understood that the new Impath decoders would not be capable of decoding existing MPEG-4 encoded by Core Tec encoders, and not even existing MPEG-2 encoded by CHART's existing (and much older) Impath VSG 1000 MPEG-2 encoders. However, "hooks" are provided within the H.264 Video design and implementation to allow for decoding of multiple protocols in the future. That is, these decoders are capable of decoding multiple compression types: any compression type from a list of length one (namely, H.264 for R12).

The new Impath decoders all have a username and password associated with them, and these credentials must be passed in on any attempt to command the decoder to change the multicast video stream it is decoding. The present thinking is that either a single username/password will be used for all such decoders within the entire CHART ATMS, or the username/password will be associated with the owning organization configured for the decoder. In either case, no database modifications will be required. In the former case, the global username/password will be stored in the VideoService properties file, and in the latter case, the mapping of username/password to owning organization will be stored in the existing SYSTEM_PROFILE table. A third option remains remotely possible, that every decoder in the ATMS will have its own username and password. In this case, the username and password would need to be added to an existing database table. This will be fleshed out if the need arises.

All of the new Impath Codecs are communicated to via HTTP. Reconfiguration is accomplished via an HTTP POST. This is accomplished via existing CHART utility classes XMLHTTPService (representing a decoder being communicated to) and XMLHTTPRequest (representing the POST request, including the XML payload providing the desired new configuration. An "OK" response indicates success.

No development is necessary to support control via the new Impath encoders. The encoders pass all camera control commands directly through to the camera controller untouched, and likewise pass responses from the controller untouched back to the caller, the same as the other ATMS encoders do.

3.6 Error Processing

In general, CHART ATMS traps conditions at both the GUI and at the server. User errors that are trapped by the GUI are reported immediately back to the user. The GUI will also report communications problems with the server back to the user. The server may also trap user errors and those messages will be written to a server log file and returned back to the GUI for display to the user. Additionally, server errors due to network errors or internal server problems will be written to log files and returned back to the GUI.

3.7 Packaging

3.7.1 CHART ATMS

This software design is broken into packages of related classes. The table below shows each package that is new or changed to support the Release 12 features.

Table 3-1. CHART ATMS Packages

Package Name	Package Description
CHART2.CameraControlModule	This package is updated to support the new Impath encoders for cameras and other video sources, as well as the new decision support eligible flag for cameras.
CHART2.Common	This package is changed to include new IDL definitions.
CHART2.DMSControl	This package has IDL changes to allow for management of traveler info message holidays and to allow multiple traveler information messages to be enabled for a DMS, with new holiday and day of week settings being used to determine which enabled message will be active.
CHART2.DecisionSupport	This package is changed to include new IDL definitions for route information and changes to suggestion data to include route information.
CHART2DecisionSupportSvcUtil	This package is changed to include the new route information.
CHART2DecisionSupportSvcUtil.dms	This package is changed to include the new route information and methods for determining if a DMS should be suggested based on its route.
CHART2DecisionSupportSvcUtil.har	This package is changed to include the new route information and methods for determining if a HAR should be suggested based on its route.
CHART2DecisionSupportSvcUtil.video	This package is changed to include the new route information and methods for determining if a camera should be suggested based on its route.
CHART2.DMSControlModule	This package is changed to support the changes to the IDL in DMSControl and to support the use of holiday and day of week settings to determine which traveler info message will be active for a DMS.
CHART2.ExternalInterface.EventImportModule.Insert	This package is updated to handle the new agency name filter used during traffic event import.
CHART2.MessageTemplateManagement	This package is changed to include new IDL definitions for the route filter settings and to persist the route settings in the database.

Package Name	Package Description
CHART2.MonitorControlModule	This package is updated to support the new Impath decoders for monitors.
CHART2.ResourceManagement	This package is changed to add an attribute to the Organization CORBA interface.
CHART2.ResourcesModule	This package is changed to support the new attribute in the Organization interface and to add a CORBA event to notify event consumers when an Organization's configuration has changed.
CHART2.RouterControlModule	This package is updated to support the new Impath codecs for bridge circuits.
CHART2.TrafficEventManagement	This package has IDL changes required to support linked events in CHART and the addition of an Agency Name filter for traffic event import. Additional changes for web alert geoscope and related fields for MD511.
CHART2.TrafficEventModule	This package is changed to support the new concept of linked events including the creation of linked CHART events, unlinking events, linking existing events and updating linked CHART event via their linked external events.
CHART2.Utility	This package contains various miscellaneous changes for R12.
CHART2.Utility.GIS	This package is change to contain utility methods for transforming route coordinates.
CHART2.VideoControl	This package is changed to add IDL definitions for the new Impath H.264 processing.
CHART2.VideoUtility.iMPath	This package is changed to add protocol handlers for the new Impath decoders (for H.264 only).
CHART2.webservices.dataexporter.trafficeventexportmodule	This package is changed to support export of MD511 fields for Scope of Impact and Public Alert Text and Public Alert TTS Text.
chartlite.data	This package is changed to support new System Profile settings and the new decision support route information.
chartlite.data.dms	This package is changed to support changes to DMS traveler info messages and to add route information to DMS suggestion data.
chartlite.data.har	This package is changed to add route information to HAR suggestion data.
chartlite.data.templates	This package is changed to add the route filter settings to the decision support message template configuration.
chartlite.data.video	This package is changed to support the new H.264 compression type and the new Impath H.264-capable codecs, to add route information to camera suggestion data, and to add the decision support eligible flag to the camera configuration.
chartlite.servlet	This package contains miscellaneous changes for R12 including changes to support the new Suggestions map.
chartlite.servlet.dms	This package is changed to support traveler info message holidays and changes to DMS traveler info messages.
chartlite.servlet.templates	This package is changed to support changes to decision support message template editor.

Package Name	Package Description
chartlite.servlet.trafficevents	This package contains changes to support creation, linking/unlinking and managing linked events and changes for adding interesting external events to the Home Page and Open & Open/Closed event list. Changes to updates to the Basic Event Data fields for MD511. Changes to add route information to decision support suggestion data.
chartlite.servlet.usermgmt	This package contains changes to support enable/disable travel time messages system-wide per organization; changes for linked event related configuration settings; changes for adding interesting external events to the OpCenter report, and changes for decision support route settings.
chartlite.servlet.video.source	This package is changed to support the new Impath H.264-capable codecs and to support the new decision support eligible flag.

3.8 Assumptions and Constraints

3.8.1 Travel Time Messages

1. Assumption: The MDTA Travel Time System interface will be identical to the INRIX system's interface.
2. Assumption: The MDTA Travel Time System will provide data for only 2 links, one for each direction of HOT lanes on I-95. (If the number of links provided is increased significantly, this could have a significant impact on the size of the CHART ATMS database.)
3. Assumption: We will poll the MDTA Travel Time System approximately every 2 minutes. (This polling interval is adjustable via a configuration setting, but if we poll it significantly more frequently than 2 minutes that will have an impact on the CHART ATMS database size.)
4. Assumption: Administrators will maintain the list of traveler information message holidays, editing the holiday dates from year to year. (The system has no means to indicate which holidays have passed or to automatically remove old holidays.)

3.8.2 CAD 911 Integration

1. Assumption: There are no new RITIS Traffic Event Import message set changes for R12.
2. Constraint: Existing Constraint limiting the number of currently open external traffic events in CHART (current limit is 300 – configurable).

3.8.3 MD 511 Integration

1. Assumption: MD511 Floodgate messages and existing CHARTWeb Traffic Alerts are similar in content and timing.

2. Assumption: CHART TTS used during user preview is similar to MD511 TTS.
3. Assumption: From the CHARTWeb perspective, when a CHART user selects the 'General" public alert category it is the same as if they had previously selected the "Web Alert" check box, e.g. when deciding to flash the "Traffic Alert" text.

3.8.4 Decision Support – Routing

1. Constraint: The ATMS decision support features are dependent on the GIS web service for route information. Without this route information, only a limited subset of decision support functionality is available.
2. Constraint: The accuracy of the ATMS decision support suggestion data is dependent on the accuracy of the H.I.S. road network data used in the GIS web service.

3.8.5 H.264 Video

1. Assumption: The protocol for the VSG 5K-series decoders will be similar to the protocol for the i5110-D decoder. (The i5110-D protocol is known, but the API documentation for the VSG 5K-series decoders is being withheld pending execution of a non-disclosure agreement between CSC and Impath.)
2. Assumption: Passwords for decoders will be managed at a high level (either one username/password for all decoders, or one username/password per decoder owning organization).
3. Assumption: Control of cameras via the Impath i5110-E encoder will indeed require no development work, that control commands and responses are passed through the encoder untouched as happens with the other CHART ATMS encoders.
4. Constraint: Impath readily states that the decoders CHART has selected are NOT universal decoders. Impath does not guarantee (and, in fact, doubts) that these decoders will decode H.264 encoded by other vendors' products. There is too much variance allowed in the H.264 specification.

4 Human Machine Interface

4.1 Travel Time Enhancements

This section describes the user interface changes in R12 related to the Travel Times feature.

Changes will include system-wide configuration, including the definition of holidays for scheduling travel time / toll rate messages, and enabling / disabling travel time messages on a per-organization basis.

There will also be DMS configuration and status changes to allow the holiday and day-of-week applicability rules for travel time / toll rates to be specified. Status changes will include the ability to enable more than one traveler info message (with only one active). The user will be able to specify the precedence order for determining which of the eligible messages will be active.

There will also be a page summarizing the messages displayed on DMSs that are configured to display travel time messages. This will help users find travel time DMSs that are not currently displaying travel time messages but should be, etc..

The sections below provide details on all of the changes.

4.1.1 System Configuration Changes

An administrator with the Enable/Disable Travel Times System Wide right will be able to specify whether travel time messages are enabled or disabled for DMSs owned by specified organizations.

An administrator with the Configure System right will be able to specify the system-wide holidays for use in per-DMS applicability rules that determine the days on which a travel time or toll rate message may be displayed.

Details for these pages are provided below.

4.1.1.1 Per-Organization Travel Time Message Settings

An administrator with the Enable/Disable Travel Times System Wide right (for at least one organization) will be able to enable or disable travel time messages on DMSs owned by specified organizations, if the user has rights for those organizations. The page may be invoked from the System Profile page (see below) or from the Travel Time Summary page.

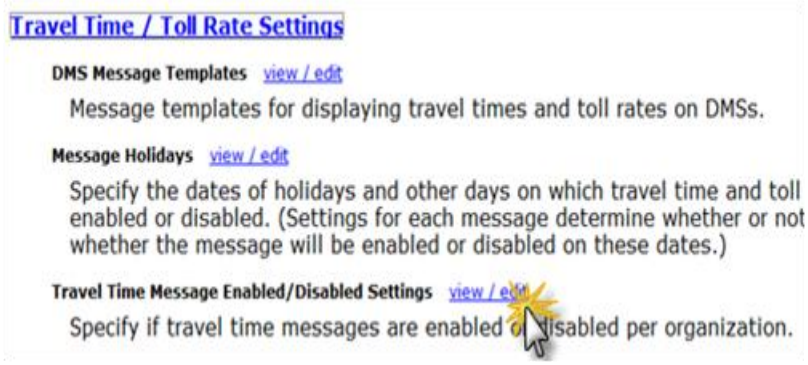


Figure 4-1. Per-Organization Travel Time Message Settings (Menu)

Clicking View / Edit brings up the Set Travel Time Messages Enabled / Disabled form.

Figure 4-2. Set Travel Time Messages Enabled / Disabled Form

By default this form shows only organizations which own DMSs, although unchecking "Show only organizations that currently own a DMS" will cause all organizations to be displayed on the form. (The checkboxes of any organizations for which the user does not have rights to change will be disabled). The user will be able to click "All" or "None" to check or uncheck all non-disabled checkboxes that are displayed.

4.1.1.2 Travel Time / Toll Rate Message Holidays

An administrator with the Configure System right will be able to specify the system-wide holidays for use in per-DMS applicability rules that determine the days on which a travel time or toll rate message may be displayed. The administrator will be able to invoke the Travel Time / Toll Rate Message Holidays page from the System Profile menu under Travel Time / Toll Rate Settings.

Figure 4-3. Travel Time / Toll Rate Settings Menu

Clicking on the View / Edit link will cause the Set Travel Time / Toll Rate Message Holidays form to appear.

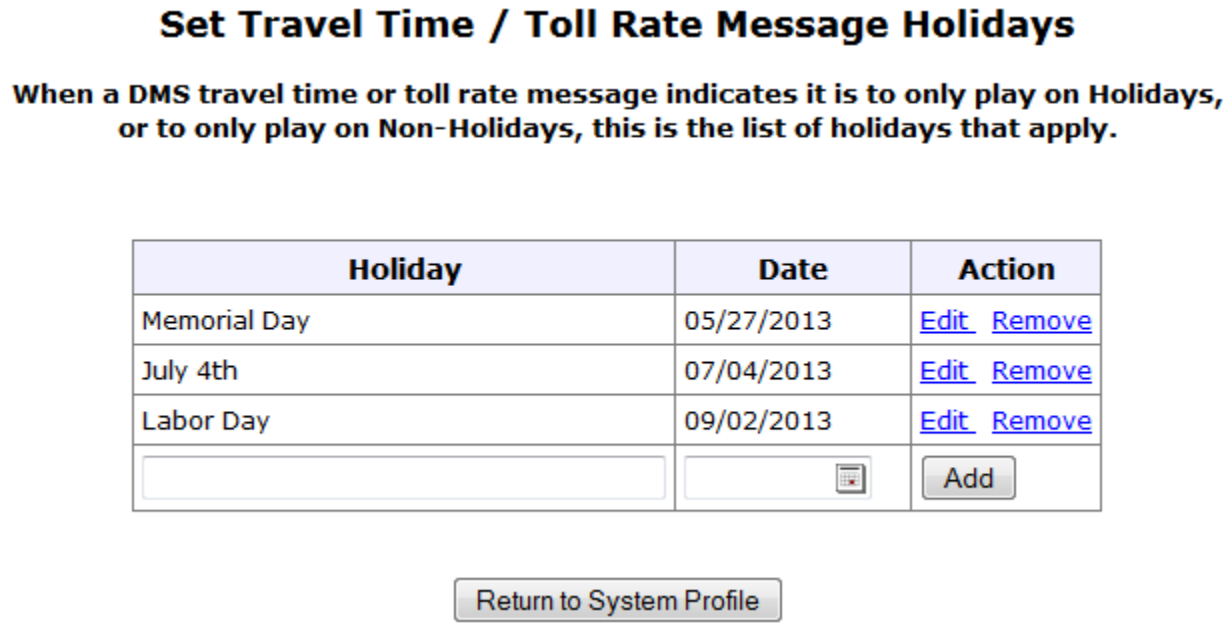


Figure 4-4. Set Travel Time / Toll Rate Message Holidays

The administrator will be able to add, edit, or remove holidays. Only one holiday is allowed per date, so any Add or Edit operation specifying a date already in the list will cause the existing date to be overwritten with the newly specified holiday's name. If a date is changed during an Edit operation, the old date will be replaced.

4.1.2 Per-DMS Traveler Information Message Configuration and Status Changes

In R12, a user will be able to specify holiday and/or day-of-week rules when adding or editing a DMS traveler information message. The existing form will be updated to add fields for specifying these rules.

The DMS Details page will be updated to show the new status resulting from the application of these rules. In R12, multiple messages may be "enabled" so that more than one can be eligible for display based on the holiday and day-of-week rules, but at most one can be "active" at a given time. The status will indicate the enabled messages, the new weekday / holiday rules, and the active message. A user with the Configure DMS right will be able to move the messages up or down in priority.

Details for each of these pages are described in the sections below.

4.1.2.1 Add (Or Edit) DMS Travel Time / Toll Rate Message Form

The form that is used to add or edit a travel time or toll rate message for a DMS will be enhanced to allow holidays (or non-holidays) and/or days of the week to be specified. The message will be eligible to be active on a given day only if it meets the specified holiday and day-of-week criteria.

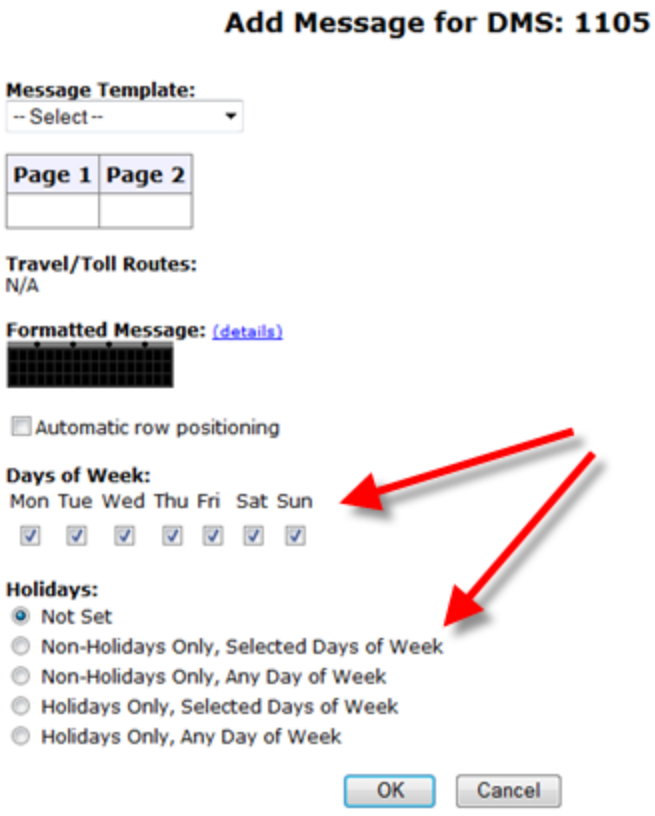


Figure 4-5. Add (Or Edit) DMS Travel Time / Toll Rate Message Form

If the Holidays selection is "Not Set", the message is applicable for any day matching the specified Days of Week.

If "Non-Holidays Only, Selected Days of Week" is selected, the message is applicable for a day matching the specified days of week, but only if it does not fall on a holiday.

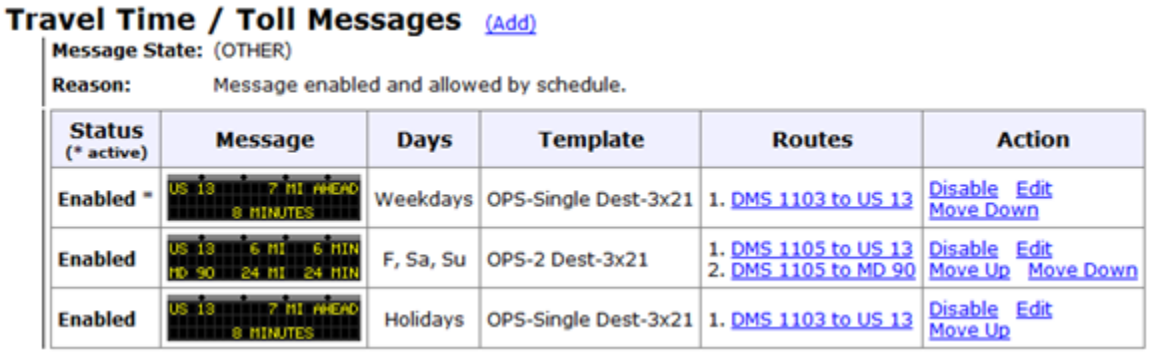
If "Non-Holidays Only, Any Day of Week" is selected, the message is applicable for any day that is not a holiday.

If "Holidays Only, Selected Days of Week" is selected, the message is applicable for a day matching the specified days of week, but only if it falls on a holiday.

If "Holidays Only, Any Day of Week" is selected, the message is applicable for any day that falls on a holiday.

4.1.2.2 DMS Details – Travel Time / Toll Rate Message Status

In R12, the system will be changed to allow multiple travel time / toll rate messages to be enabled, to accommodate the new days of week and holiday applicability rules. The Travel Time / Toll Messages section of the DMS Details page will be changed to reflect the new behavior.



Travel Time / Toll Messages (Add)

Message State: (OTHER)

Reason: Message enabled and allowed by schedule.

Status (* active)	Message	Days	Template	Routes	Action
Enabled *	US 13 7 MI AHEAD 8 MINUTES	Weekdays	OPS-Single Dest-3x21	1. DMS 1103 to US 13	Disable Edit Move Down
Enabled	US 13 6 MI 6 MIN MD 90 24 MI 24 MIN	F, Sa, Su	OPS-2 Dest-3x21	1. DMS 1105 to US 13 2. DMS 1105 to MD 90	Disable Edit Move Up Move Down
Enabled	US 13 7 MI AHEAD 8 MINUTES	Holidays	OPS-Single Dest-3x21	1. DMS 1103 to US 13	Disable Edit Move Up

Figure 4-6. Travel Time / Toll Message Status Changes

For R12, in the Status column, multiple messages may appear as "Enabled", but only one can be active, and an "active" indicator will be displayed. A new "Days" column will indicate the days of week and/or holiday rules specified for the message.

It is possible that more than one message is eligible to be displayed at a given time. To determine which one is active, the system will use a priority scheme where the first eligible message in the list takes precedence over ones below it.

A user with the Configure DMS right will be able to move a message up or down relative to the other messages by clicking the "Move Up" or "Move Down" links.

A new Message State is being added for R12 that will indicate "No Message Active" if none of the enabled messages is eligible to be active (due to not satisfying the days of week or holiday rules, etc.). If a recently enabled message could not be activated immediately, the reason will contain the reason that the message could not be activated. Thereafter (i.e., not immediately after a message was enabled) the Reason field will indicate the problem for the first enabled

message in the list if no message is eligible to be active. If a message is active, the Reason will apply to the active message.

Note that the availability of data will NOT affect which message is active. For example, a message at the top of the list (highest priority) will be active even if it does not have travel time data available for the route, even if a lower priority message has all data available. In this case the DMS would have no traveler information message, and the Reason field would indicate that data is missing.

4.1.3 Travel Time Enabled DMSs List (New)

A new page will be added for R12 to summarize the usage of DMSs that are configured to have any messages containing travel time tags (regardless of the DMS comm mode or the state of the messages).

To Invoke the list, a user will be able to click the "Travel Times" link under the General section of the menu:

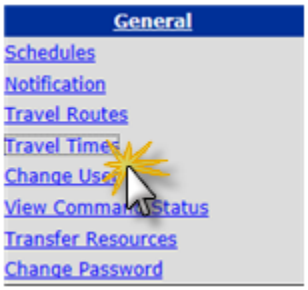


Figure 4-7. Travel Times (Summary) Link

Clicking on this link will invoke the Travel Time Enabled DMSs page. The Travel Time Enabled DMSs list has features similar to other dynamic lists that exist in the CHART ATMS GUI. The list can be sorted and filtered, and the columns that are shown can be customized. By default, the list will show the Description/Location, Current Message, and Queued Messages:

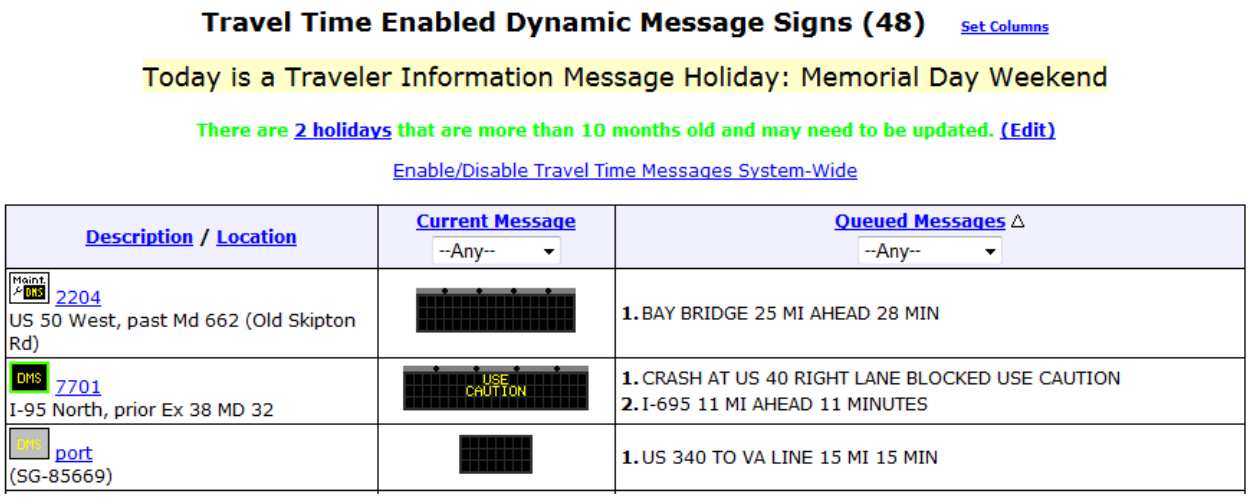


Figure 4-8. Travel Time Enabled DMSs (Default Columns)

Clicking on the "Enable/Disable Travel Time Messages System-Wide" link will bring up the per-organization travel time settings (described in a previous section). This link will be available if the user has the right to enable/disable travel time messages system-wide for at least one organization.

If the user has the configure system right, a message will appear when one or more holidays are N months in the past, where N is configurable in the system profile. A link will accompany this message to allow the user to view the system profile page used to configure travel time message holidays.

If the current date is defined as a travel time message holiday in the system profile, a message will appear stating the name of the holiday.

Clicking on the "Set Columns" link will bring up a popup that allows the user to select which columns to display.

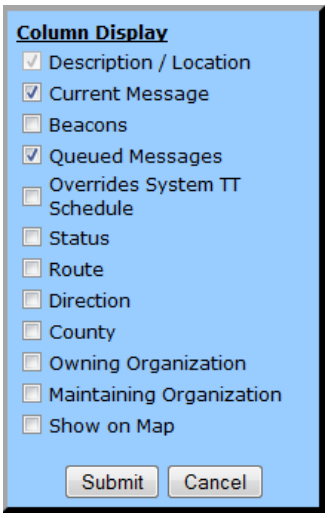


Figure 4-9. Travel Time Enabled DMSs - Set Columns Popup

The user will be able to select or deselect any column except for the Description / Location (which is mandatory) to show or hide the column.

Table 4-1 shows the columns available for display.

Table 4-1. Columns Available for Display

Column Name	Description	Sortable	Filterable
Description / Location	This column provides a description of the DMS, which is typically the number of the DMS. It also contains a description of the location of the DMS. This column is displayed by default and cannot be hidden.	Yes / Yes	No / No
Current Message	The current message displayed on the DMS. This column is filterable by the values: Blank, Not Blank, and Event Message. This column is displayed by default.	Yes	Yes
Beacons	Indicates whether the DMS's beacons are on or off.	Yes	Yes
Queued Messages	Displays other messages on the Arbitration Queue (not the current message). This column is filterable by None or "One or more". This column is displayed by default.	Yes	Yes
Override TT Sched	A flag indicating whether the DMS overrides the system-wide travel time schedule that specifies the times of the day when travel time messages may be displayed.	Yes	Yes
Status	The DMS's comm mode and failure status	Yes	Yes
Route	The name of the route along which the DMS is located.	Yes	Yes
Direction	The direction of traffic that can view the DMS.	Yes	Yes
County	The county in which the DMS is located.	Yes	Yes
Owning Org	The organization that owns the DMS.	Yes	Yes
Maintaining Org	The organization responsible for maintaining the DMS.	Yes	Yes
Show On Map	If the DMS has geographic coordinates, contains a "Show On Map" link which (if clicked) causes the Home Page map to display the DMS.	Yes	Yes

If non-default columns are selected, a "show default columns" link will be displayed to allow the user to revert to the default columns. If one or more filtering values are selected, a description of the filtering values will be displayed, and there will be a "View All" link for clearing all of the filters to display all of the DMSs originally displayed in the list.

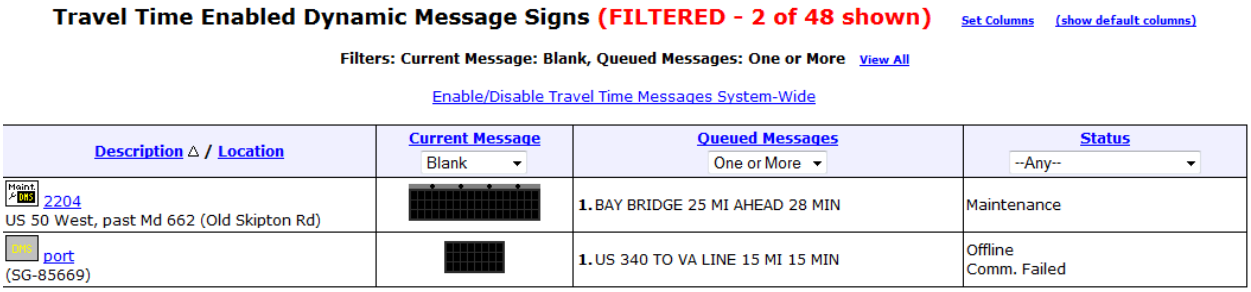


Figure 4-10. Travel Time Enabled DMSs - Non-Default Columns and Filters

4.2 CAD 911 Integration

This section describes the user interface changes in R12 related to the CAD 911 Integration feature.

Changes will include system-wide configuration for enabling / disabling External Event update indicators for linked event sections on linked CHART events. Also, a new agency filter criteria will be added to the event import rules.

There will also be changes for Event Details pages for both external events and CHART events to create, manage, link and unlink events.

There will also be changes to the existing traffic event summary page to display linked event related information. These summary pages include: Operations Center Report, Open & Open/Closed Event List, and the Home Page.

The sections below provide details on all of the changes.

4.2.1 System Configuration Changes

4.2.1.1 Configure External Event Update Indicators for Linked CHART Events

An administrator with the Configure System right will be able to specify the system-wide settings that enable or disable the External Event Update Indicators for the 4 linked event sections supported for the linked event feature. These settings determine if changes to the external event data related to the specified linked event section will cause an update indicator to appear on the Event Details page or Traffic Event Summary pages (Operations Center Report, Open & Open/Closed Event List, and the Home Page). These settings are added to the existing External System Related Settings page in the System Profile Properties.

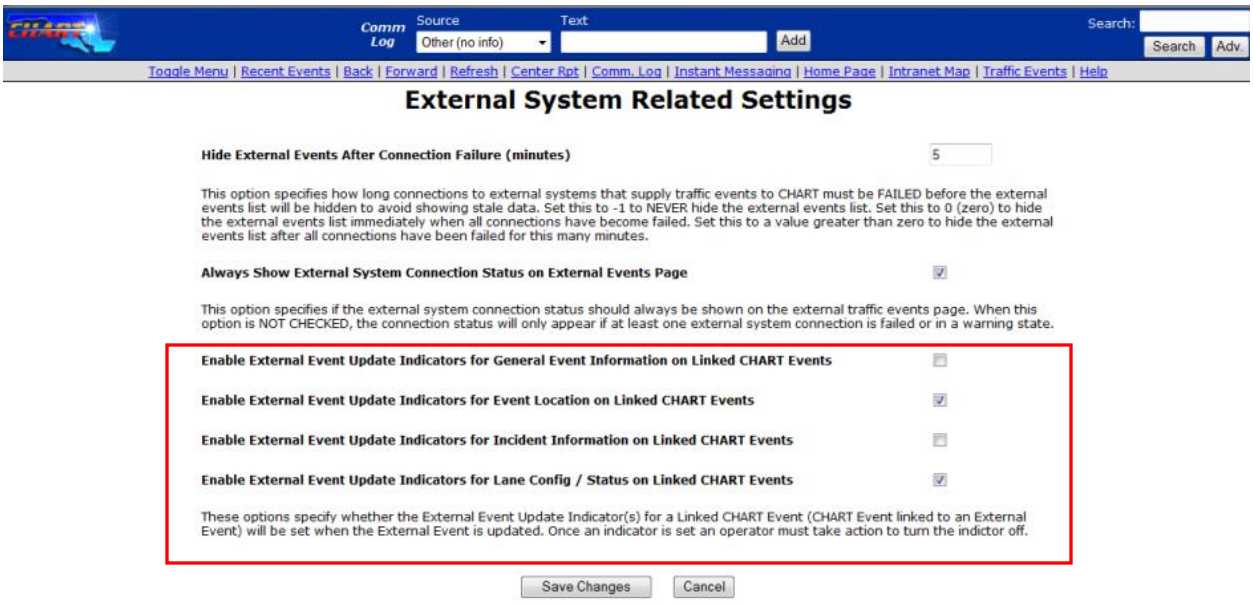


Figure 4-11. New Sys Profile Props for Linked Events

4.2.1.2 Agency Filter Criteria for Traffic Event Import Rules

An administrator with the Configure System right will be able to specify external agency name filters for Traffic Event Import Rules.

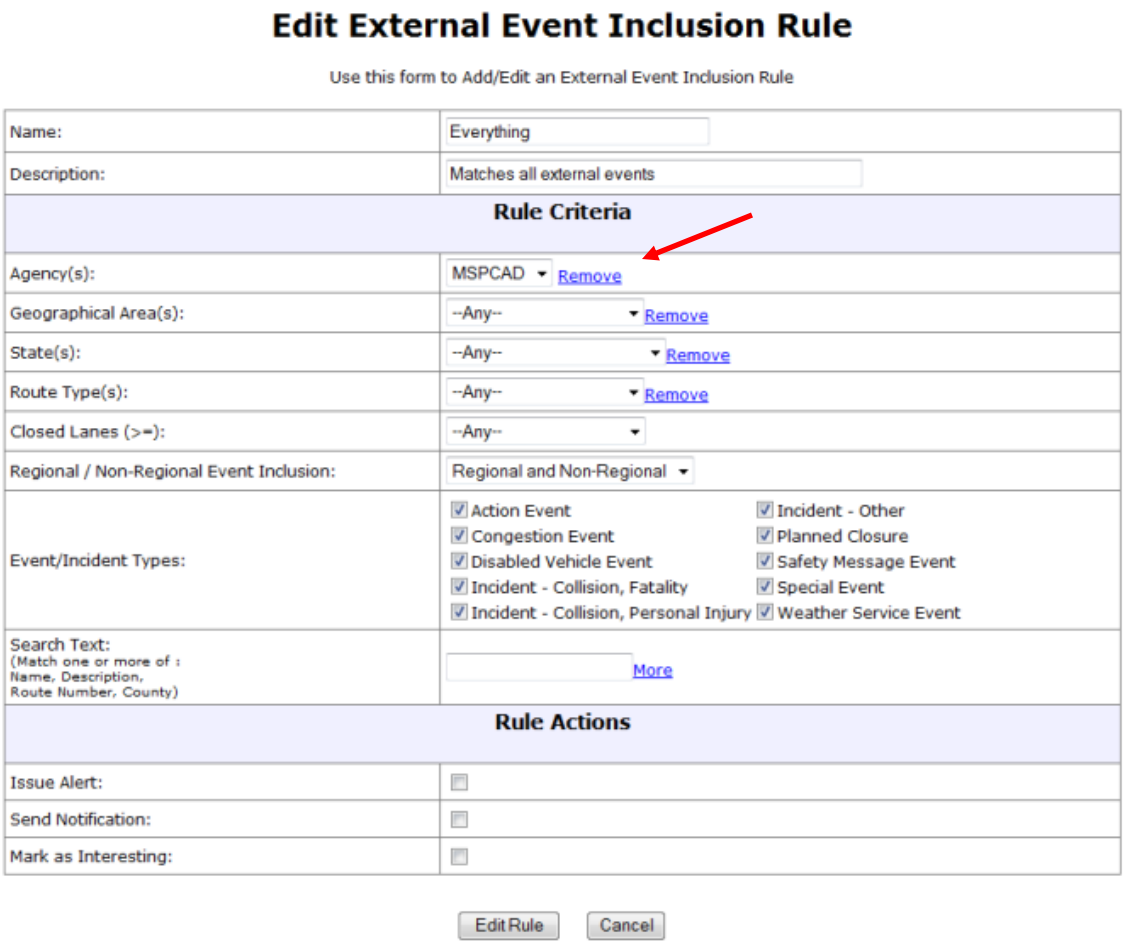


Figure 4-12. New Agency filter for Event Import Rules

4.2.2 Traffic Event Details Page Changes for Linked Events

In R12, a user with manage events right will be able to create a Linked CHART event from an external event. The new created CHART event will be linked to the external event which can update certain information in the linked CHART event when the linked external event is updated by RITIS. There are four sections on the CHART event details that can be updated by the external event. These are referred to as Linked Event Sections:

- General Event Information
- Event Location
- Incident Information
- Lane Config

The other sections of the CHART event (Response Plans, Participants, Notifications, Surface Conditions & Nearby Weather Station, and Associated Events) are totally under the control of the operator and are used to manage the event as usual.

When a linked CHART event is created all Linked Event Sections are updated with external information (only info currently being imported as defined in the Traffic Event Import ICD) when the external event is updated from the RITIS Service. A user may override a Linked Event Section at any time by manually updating information in that section. When a Linked Event Section is overridden it is blocked from further external updates. A user can choose to revert a Linked Event Section back to using external data at any time.

A user is able to un-link a CHART event from an external at any time. A user can also link an existing CHART event to an external event as long as neither event is currently linked to another event and the external event is of the same type.

Details of these changes are described below.

4.2.2.1 Create Linked CHART Event from External

For R12 a user with manage event rights can create a Linked CHART Event from an external by clicking the 'Create Linked Event' button on the specified external event's details page. This will create a new CHART event that is automatically linked to the external event. This is similar to how an associated event was created from an external event prior to R12.

The newly create linked CHART event will initially have its 4 linked event sections populated with imported data from the external event. The data in the linked event sections will continue to be updated with the external event until a user overrides one or more linked event sections which blocks the data from further external update.

Linked Event Sections that are currently receiving updates from the linked external event will have a background color of blue match the background color of an external event.

Events can be un-linked by clicking the 'Remove Link' link at the top of either the linked CHART event or the external event details page.

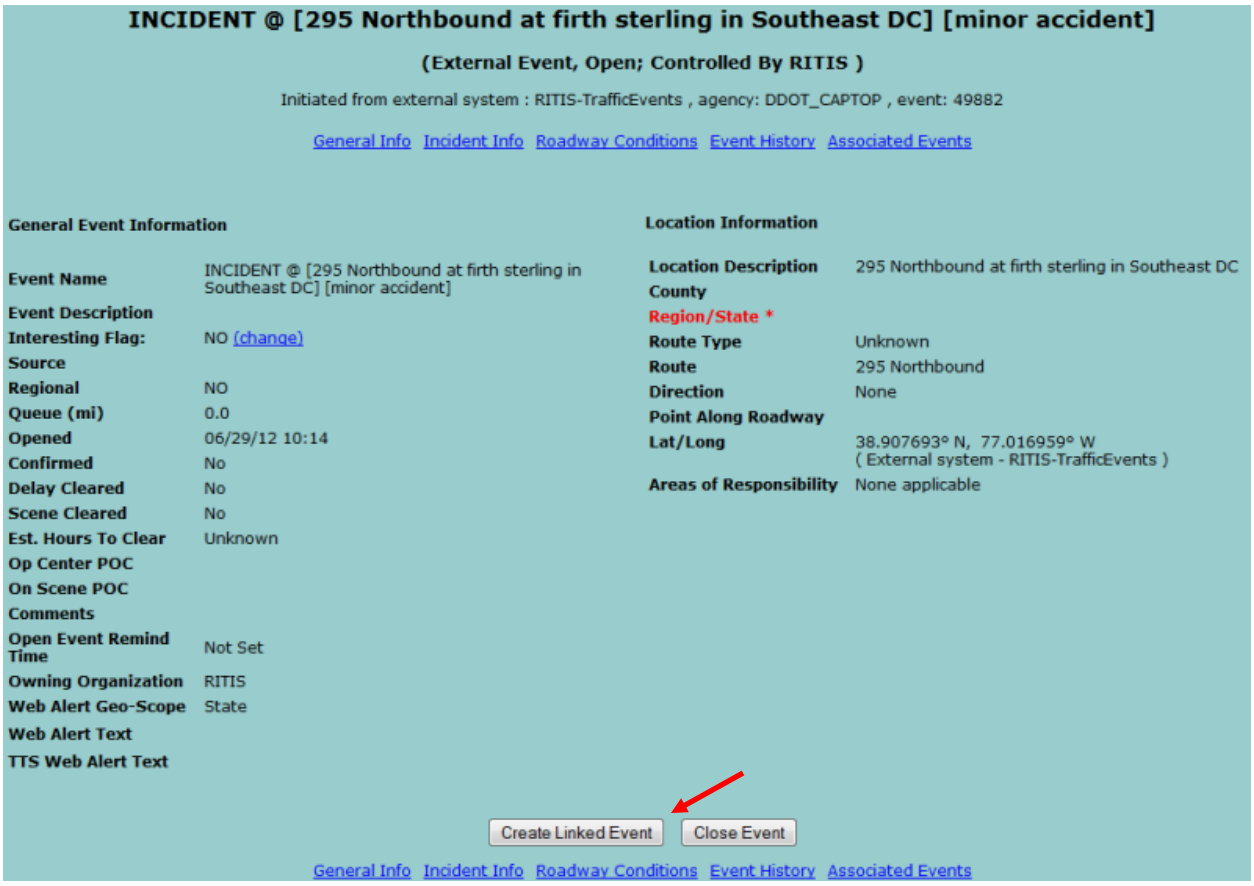


Figure 4-13. New External Event Details Button to Create Linked Event

Figure 4-14. Newly Created Linked CHART Event

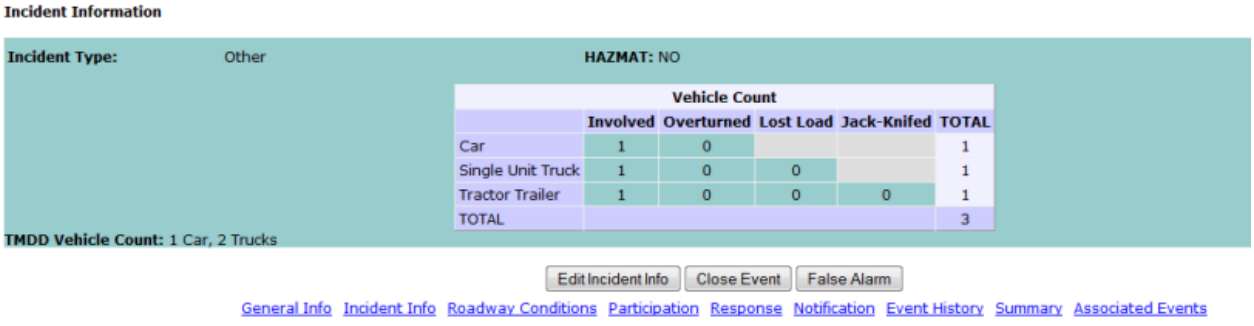


Figure 4-15. Incident Information Linked Event Section

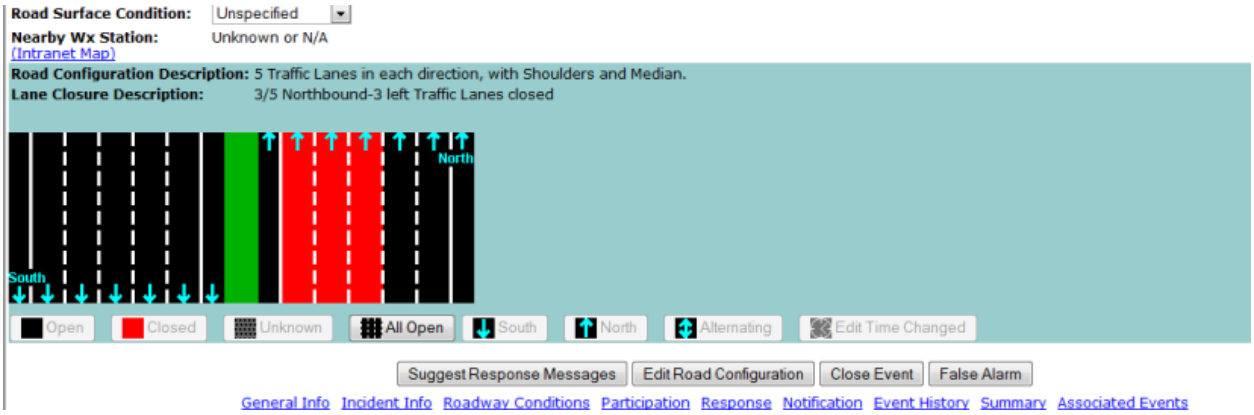


Figure 4-16. Lane Config Linked Event Section

4.2.2.2 Overriding Linked Event Sections on a Linked CHART Event

Overriding a Linked Event Section means the operator no longer wants the linked external event to provide data for that section. The operator is taking responsibility for maintaining the data in that section. The use overrides a linked event section simply by manually editing data in that section.

The example below shows a Linked CHART Event that has had its location linked event section overridden by a user. Note that the section goes back to the standard white background color. When a linked event section is overridden a link is provide for the user to see the external data for that section.

In the example below the linked external event's location is shown in a popup displayed by clicking the 'Show External Location' link. Note that the popup displaying the external location also has a 'Use External Location' button that is used to revert back to using the external location for the linked CHART Event. This essentially undoes the override of the linked event section.

Figure 4-17. Linked CHART Event with Location Overridden

Overriding other linked event sections are handled in the same manner.

4.2.2.3 Indication of External Data Changes

When external event's data changes, an indication of which linked event section was impacted is given to the user on the Linked CHART Event details page. This is done whether or not the linked event section is overridden. The indication of the change will remain until a user manually acknowledges the changes.

The examples below show an external event location change. An 'External Location Changes' label will appear below the location fields with a bright yellow background. Note that this label will appear whether the event location linked event section is overridden or not. A user must click the 'Acknowledge Location Change' button in order to remove the change indicator. For an overridden linked event section the button is on the external location popup which forces the user to view the external data. For a non-overridden linked event section the 'Acknowledge' button is on the details page. Note: when the change indicator is active it will show up on certain traffic event summary reports discussed in the next section.

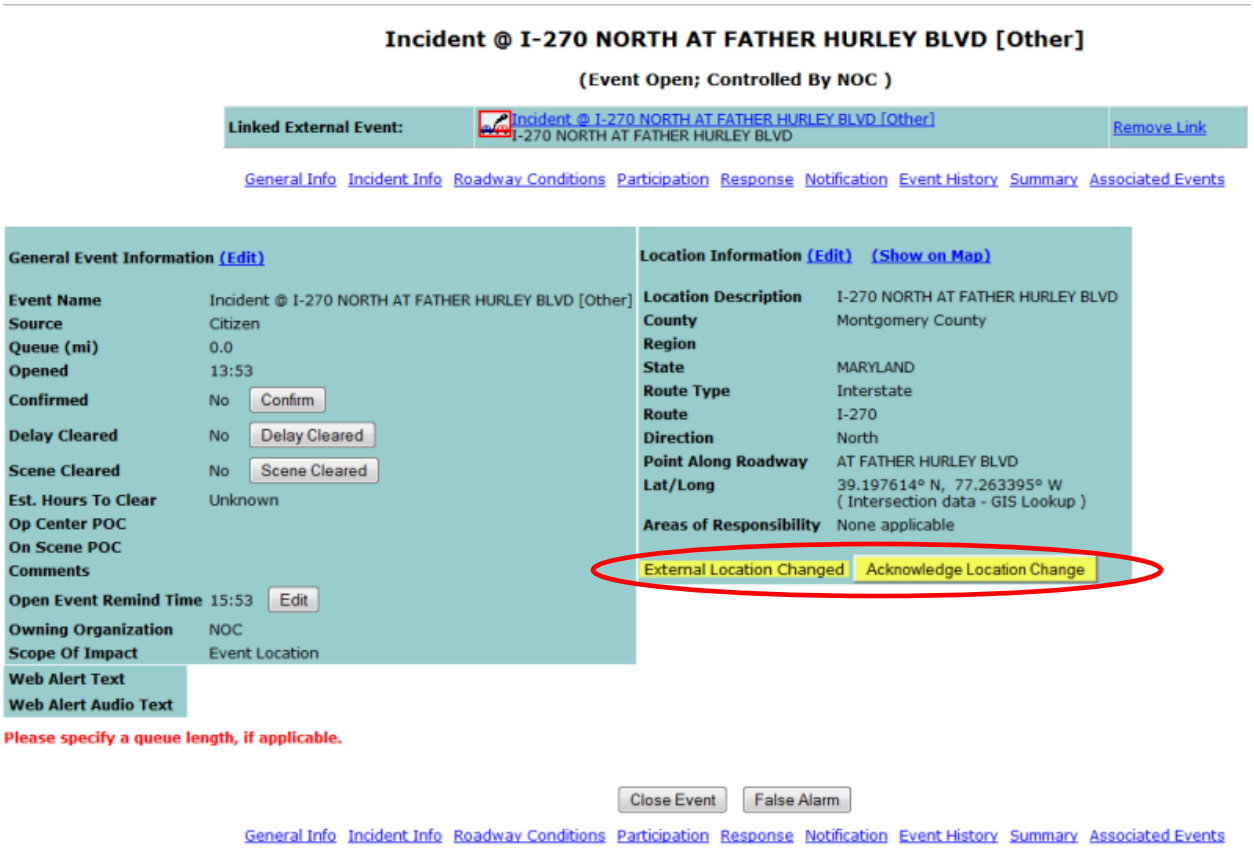


Figure 4-18. External Location Update Indicator

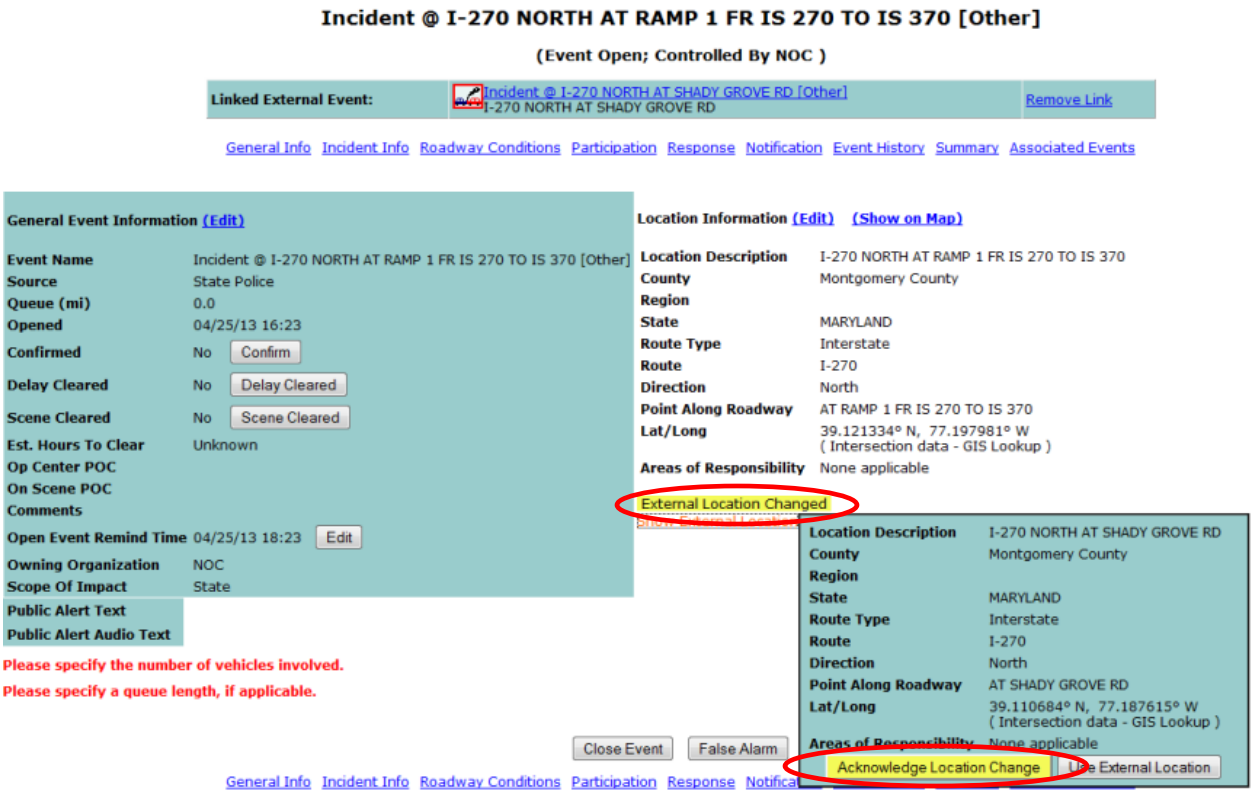


Figure 4-19. External Location Update Indicator - Location Overridden

External event change indicators for other linked event sections are handled in the same manner.

4.2.2.4 Linking Existing CHART and External Events

A user can link an existing CHART Event to an existing external event as long as neither event is currently linked to other events and the both events are of the same type. A user can link events by clicking the 'Link To External Event' at the bottom of the event details page. Note: the button will only display on CHART Events that are currently not linked and only non-linked externals of the same type will be selectable as a linked external event.

Figure 4-20. New Link to External Event Button

4.2.2.5 Event Closure and Merging

When a user closes a Linked CHART Event the link between it and its linked external event is removed. When a linked external event is closed (either by the external source or by manually by a chart user) the linked between it and its linked CHART event is not removed. This is because occasionally RITIS will erroneously close only to re-open them again a short time later. For this reason a linked external event that is closed will not be taken offline until its linked CHART event is closed.

Linked CHART cannot be the source or target of a merge. No merge button will appear on a Linked CHART Event details page and it will not be available for section as a source event for a merge event target.

4.2.3 Linked Event Information on Traffic Event Summary Lists

In order to make user aware of external events that are possible candidates for creating Linked CHART Events and also to make them aware of external event changes that may be affecting current Linked CHART Events, changes have been made to several traffic event summary displays for R12. The updated lists are:

- Operations Center Report
- Open & Open/Closed Event Lists
- Home Page Event tabs.

The example below show changes to the Operations Center Report. The changes are similar across the Open & Open/Closed Event Lists and Home Page Event tabs.

Operations Center Report For 'NOC'

All Open Events and Devices With Active Messages In System

View Shift Handoff Report

Wiki Shift Handoff Report

Open Traffic Events

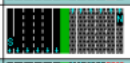
Event Description/ Location	Op Center	Regional	Direction	Event Type	County/ State	Lane Closures	Vehicles
Incident @ I-270 NORTH AT CLARKSBURG RD [Other] I-270 NORTH AT CLARKSBURG RD	NOC participants (0)	No	North	Incident (Other)	Montgomery County, MD		
Incident @ I-270 NORTH AT FATHER HURLEY BLVD [Other] I-270 NORTH AT FATHER HURLEY BLVD **Linked To External Event (Updated)**	NOC participants (0)	No	North	Incident (Other)	Montgomery County, MD		1 car involved, 1 single unit truck involved, 1 tractor trailer involved
Incident @ I-270 NORTH AT GAME PRESERVE RD [Other] I-270 NORTH AT GAME PRESERVE RD	NOC participants (0)	No	North	Incident (Other)	Montgomery County, MD		1 car (with trailer) involved, 2 pickups (with trailer) overturned
Incident @ I-270 NORTH AT MONTROSE RD [Other] I-270 NORTH AT MONTROSE RD **Linked To External Event**	NOC participants (0)	No	North	Incident (Other)	Montgomery County, MD		
Incident @ I-270 NORTH AT COMUS RD [Other] I-270 NORTH AT COMUS RD **Linked To External Event**	NOC participants (0)	No	North	Incident (Other)	Montgomery County, MD		
Incident @ I-270 NORTH AT FALLS RD [Other] I-270 NORTH AT FALLS RD	NOC participants (0)	No	North	Incident (Other)	Montgomery County, MD		1 van (with trailer) overturned, 4 single unit trucks involved
Incident @ I-270 NORTH AT RAMP 1 FR IS 270 TO IS 370 [Other] I-270 NORTH AT RAMP 1 FR IS 270 TO IS 370 **Linked To External Event (Updated)**	NOC participants (0)	No	North	Incident (Other)	Montgomery County, MD		
INCIDENT @ [SE Freeway at prior to the Pennsylvania Avenue Split] [minor accident] SE Freeway at prior to the Pennsylvania Avenue Split **Not Linked to CHART Event**	RITIS	No	None	Incident (Other)			
Action Event @ I-270 NORTH AT CAPITAL BELTWAY I-270 NORTH AT CAPITAL BELTWAY	NOC participants (0)	No	North	Action Event	Montgomery County, MD		
ACTION @ [piney branch at eastern] [traffic lights not working] piney branch at eastern **Linked To External Event**	NOC participants (0)	No	None	Action Event			
Action Event @ UNKNOWN LOCATION UNKNOWN LOCATION	NOC participants (0)	No		Action Event			

Figure 4-21. Event Summary List Changes for R12

4.2.3.1 Interesting External Events on Summary Lists

External events that are marked as interesting will now appear these pages as long as the external event is in the current op center's Areas of responsibility and is not currently linked to a CHART event. These events are possible candidate to creating linked CHART events. Note: the interesting flag for an event can be set/un-set by a user manually but can also be set as part of a Traffic Event Import Rule's actions. These external events will appear with a blue background consistent with external event displays.

4.2.3.2 Event Description / Location Updated For Linked Events

The Event Description / Location column for the updated traffic event summary lists will have the following changes:

- Yellow background for Linked Events that have un-acknowledged external event updates.
- New label under Event Description / Location "Linked to External Event" for Linked CHART Events. Label will be "Linked to External Event (Updated)" when events have un-acknowledged external event updates. Label background in blue to be consistent with external events.
- New label under Event Description / Location "Not Linked to CHART Event" for non-linked external events being display on the list.

4.2.3.3 Column Background Color Changes

The following columns will have a blue background if that data for the specific Linked CHART Event is supplied by the external event (I.E. the data's linked event section is not overridden). Note: not all columns listed display on all of the above mentioned event summary lists.

- Lane Closure Related Columns
- Location Related Columns
- Regional Flag Column
- Vehicle Involved Column

4.3 MD 511 Integration

This section describes the user interface changes in R12 related to the MD 511 Integration feature.

Changes include updates to the Edit General Info Page for the Scope of Impact setting for traffic event, the public alert audio text field, the selection of a public alert category, and indicators for display of the public web alert and web alert audio text.

There are also changes to the Event Details Page to display the modified fields under the General Event Information.

4.3.1 General Info Page Updates

4.3.1.1 Configure Geo-Scope for Public Web Alerts in CHART Events

A user with manage events right will be able to add a specific Scope of Impact for a traffic event to indicate the impact is larger than the event location suggests. The user can select from the current Event Location, Route, County, State, or Region (Multi-State).

4.3.1.2 Add Optional Public Alert Audio Text in CHART Events

A user with manage events right will also have the option to add a public alert audio text message that will be exported along with the geo-scope value to all Exporter listeners including MD511. The user may also copy the current public alert text value using the "Copy Public Alert Text" button and substitute audio pronunciations within the audio text message using the "Substitute Pronunciations" button. An Audio preview of the public alert audio text using the CHART ATMS Text to Speech engine is available by selecting the "Audio Preview" button.

4.3.1.3 Configure Optional Alerts as Draft in CHART Events

A user with manage events right will also have the option to set the public alert and public alert audio text messages as Draft. Either alert message in Draft state will indicate the message is not ready for display to the public. Public Alert messages are by default active.

4.3.1.4 Configure Public Alert Category in CHART Events

A CHART user with manage events right will have the option to indicate when a public group gets special treatment for an event. Group membership and the nature of the treatment are controlled by MD511 however CHART users select which group gets special treatment. Initial groups are 'None' (default), "General", "Amber/Silver", and "Commercial Vehicle Operations."

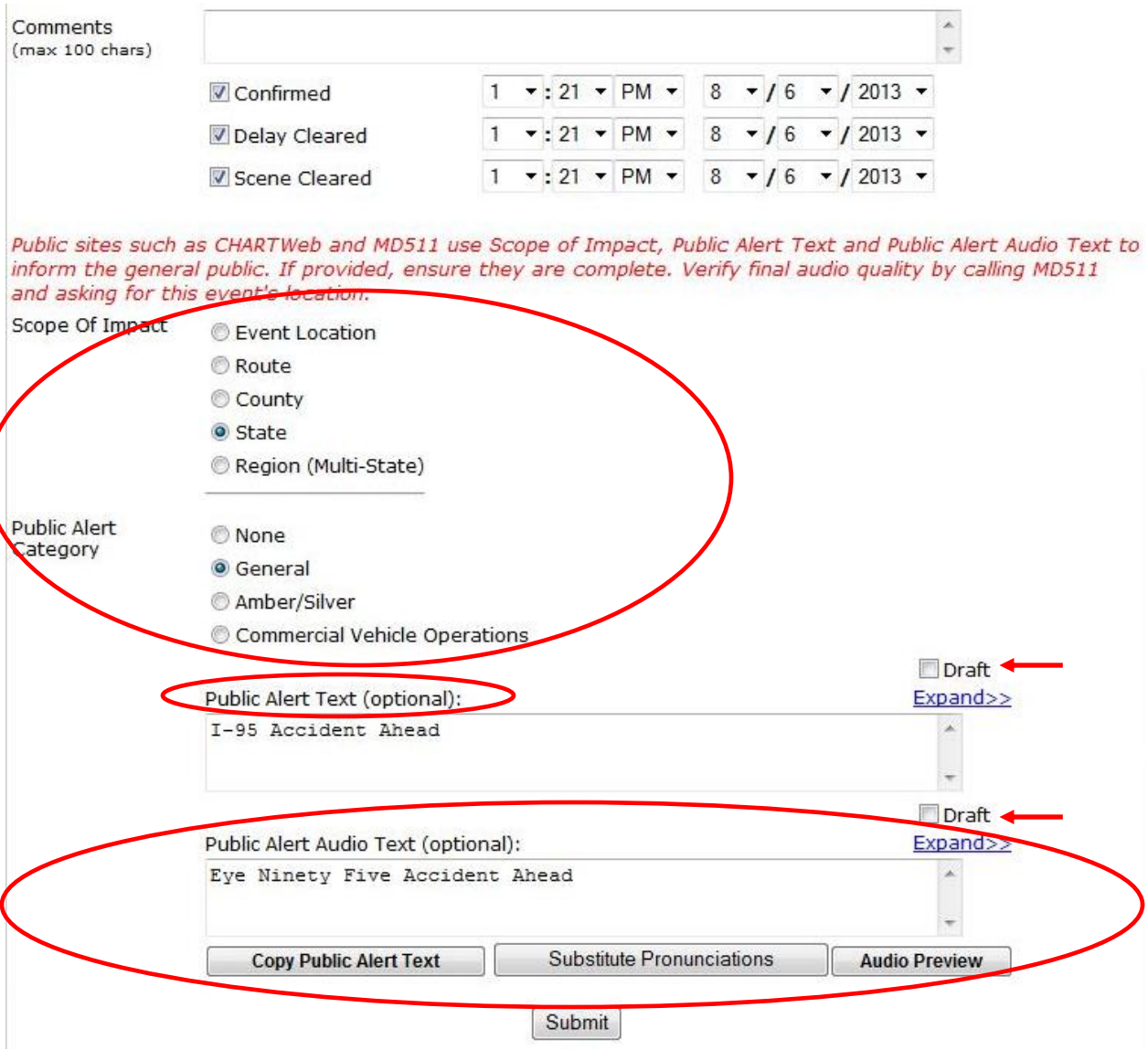


Figure 4-22. General Info Page Changes for R12

4.4 Decision Support – Routing

This section describes the features of Decision Support that were added or changed for R12. The main changes for R12 decision support were the addition of enhanced routing information and

the addition of a map for viewing and selecting suggested devices. Many of the decision support features can be seen in the Response Plan section of the Traffic Event details page (see Figure 4-23 below) including: the ability to request suggested devices for the Traffic Event, the ability to request suggested messages for devices already in the response plan, an indication of one or more devices that are not in the response plan that are recommended, an indication of one or more devices in the response plan that are not recommended, and the ability to preview the response plan on a map.

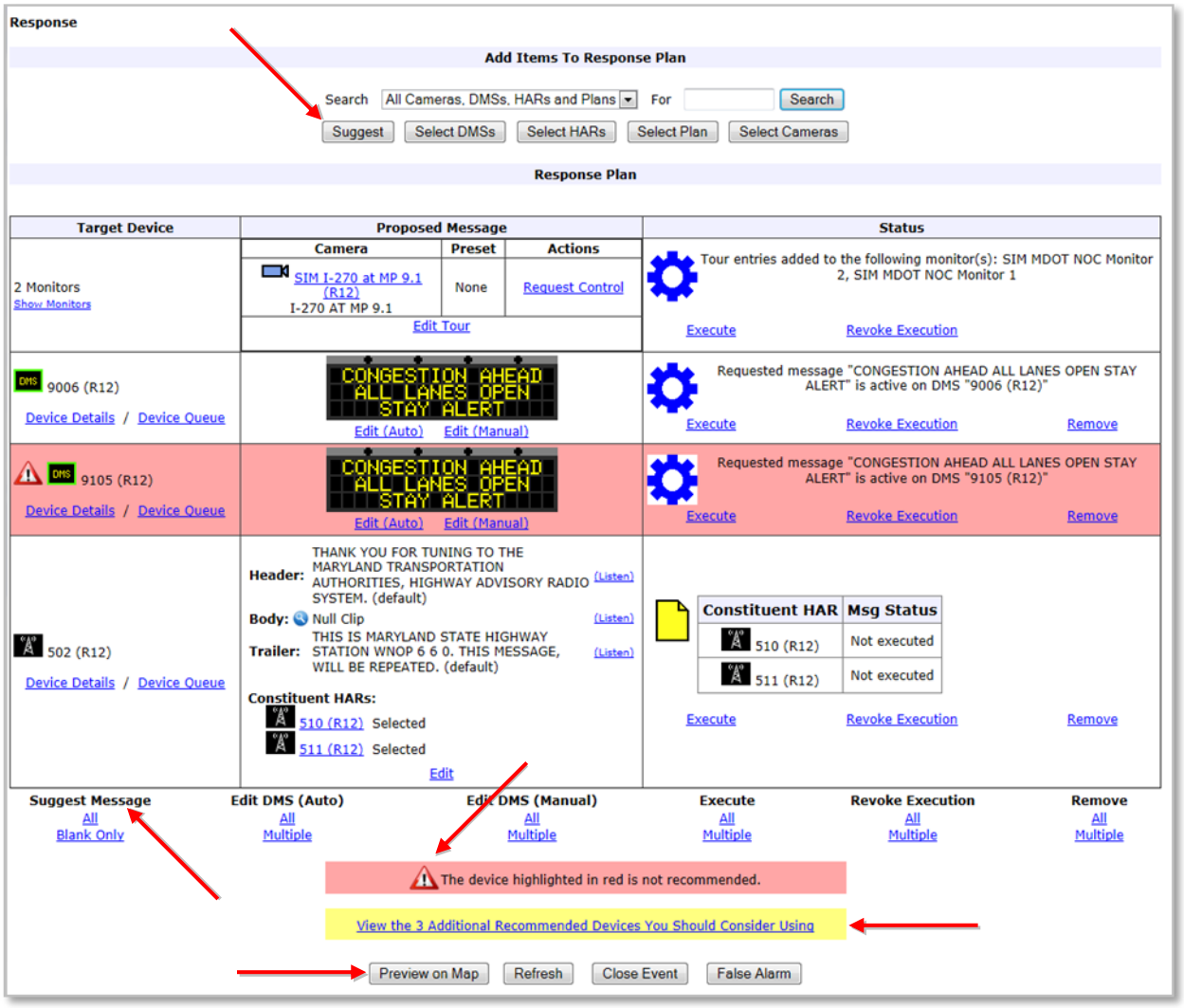


Figure 4-23. Traffic Event Response Plan Showing Features of Decision Support

4.4.1 Viewing Suggested Devices

A user can request suggested devices (DMSs, HARs, and Cameras) from the Response Plan section of the Traffic Event details page by clicking on the Suggest button (see Figure 4-24 below). Devices that are eligible for decision support (see section 4.4.2 on Configuring Devices to be Decision Support Eligible below) will be suggested based on the following criteria: the distance of a device from the traffic event, the percentage of lanes closed for the traffic event,

and the characteristics of the route from a device to the traffic event. DMSs and HARs will be suggested based on the additional criteria specified in the message template. Many of these factors are configurable for DMSs, HARs and Cameras separately and will be further described in section 4.4.3 on Configuring Decision Support Settings below. The resulting suggested devices will be displayed to the user in order from highest score to lowest score. A cutoff can be configured so that only devices equal to or greater than the cutoff will initially be visible to the user.

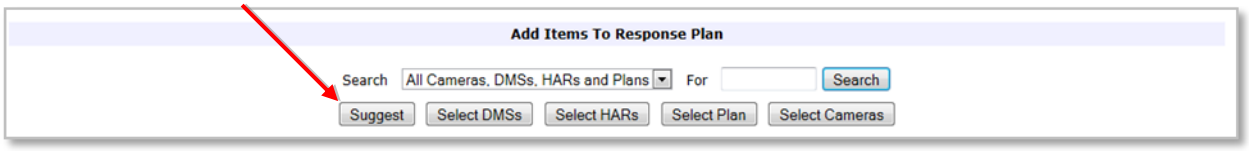


Figure 4-24. Requesting Suggested Devices for a Traffic Event Response Plan

4.4.1.1 Suggested Devices

New for R12, the suggested devices can be viewed either in a list or on a map. A user can now select either the list view or the map view as their preference for the default view on the suggestions page. User preferences for the suggestions page are described in section 4.4.1.9 on User Preferences for the Suggestions Page below.

4.4.1.1.1 The Suggested Devices List View

The list view has changed only slightly since the last release and is the initial default view for the Suggestions page. Suggested devices are listed in order by score with the highest scoring devices appearing first. For each suggested device, the following information is included in the list view (see Figure 4-25 below): the name and location, the route information (i.e. distance, turns, and U-turn), the suggested message(s) (for DMSs and HARs only), and the source and reason for each message suggestion if applicable. The distance is the drivable distance of the route from the device to the traffic event (if the drivable distance cannot be determined, the straight-line distance between the device and the traffic event will be displayed). Each suggested message will have a source (either template generated or the plan name) and the reasons that template message was suggested. Additionally, scoring information for both the device and the message may be visible depending on the user's preference settings. New features for R12 include: the in-response icon, the Show Route on Map link, and the No Message Change message option. The in-response icon is visible for each device that is currently in the response plan for the traffic event. The Show Route on Map link is visible in the Route column for each device with route information. A user can click on the Show Route on Map link to switch to the map tab and view the route from the suggested device to the traffic event on the Suggestions map. The No Message Change message option has been added to allow a user to select devices to be added to the response plan from the map. The No Message Change message option is discussed further in section 4.4.1.2 on Selecting Suggested Devices and Suggested Messages below.

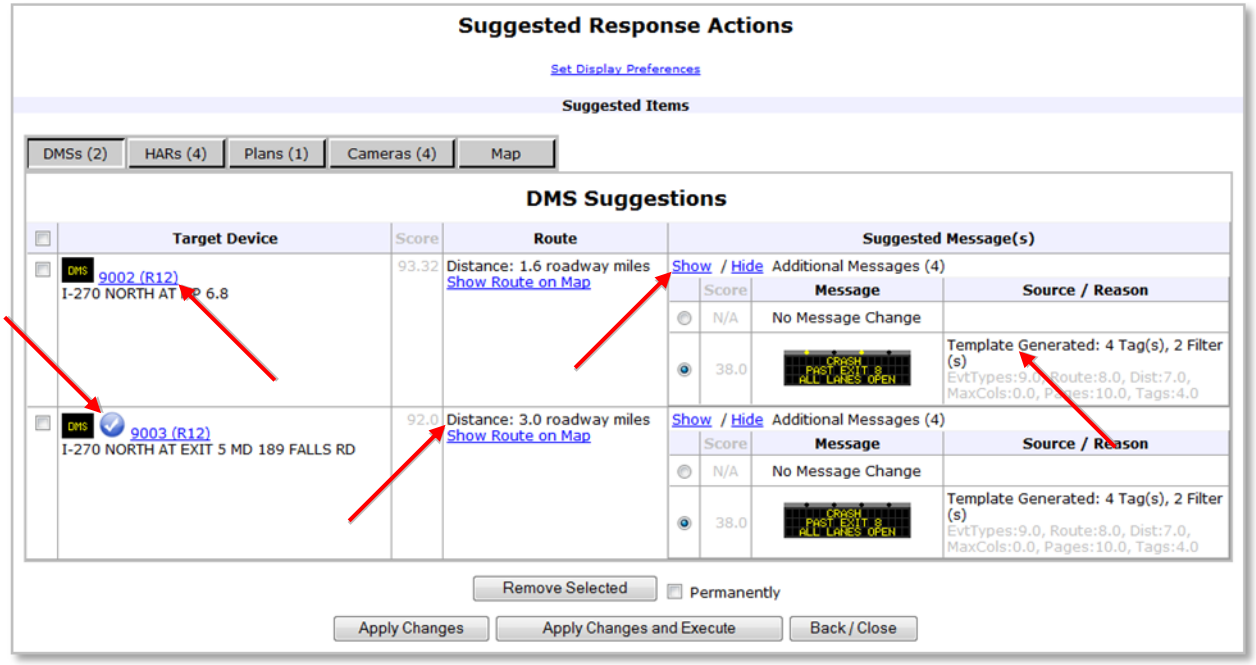


Figure 4-25. Suggested Devices for a Traffic Event Response Plan in the List View

Additional Suggested Devices

Initially, only the suggested devices with a score equal to or greater than a configurable cutoff are displayed to the user. A user can click on a link (see Figure 4-26 below) to view the additional suggested devices. The additional suggested devices will appear at the bottom of the current list of suggested devices.

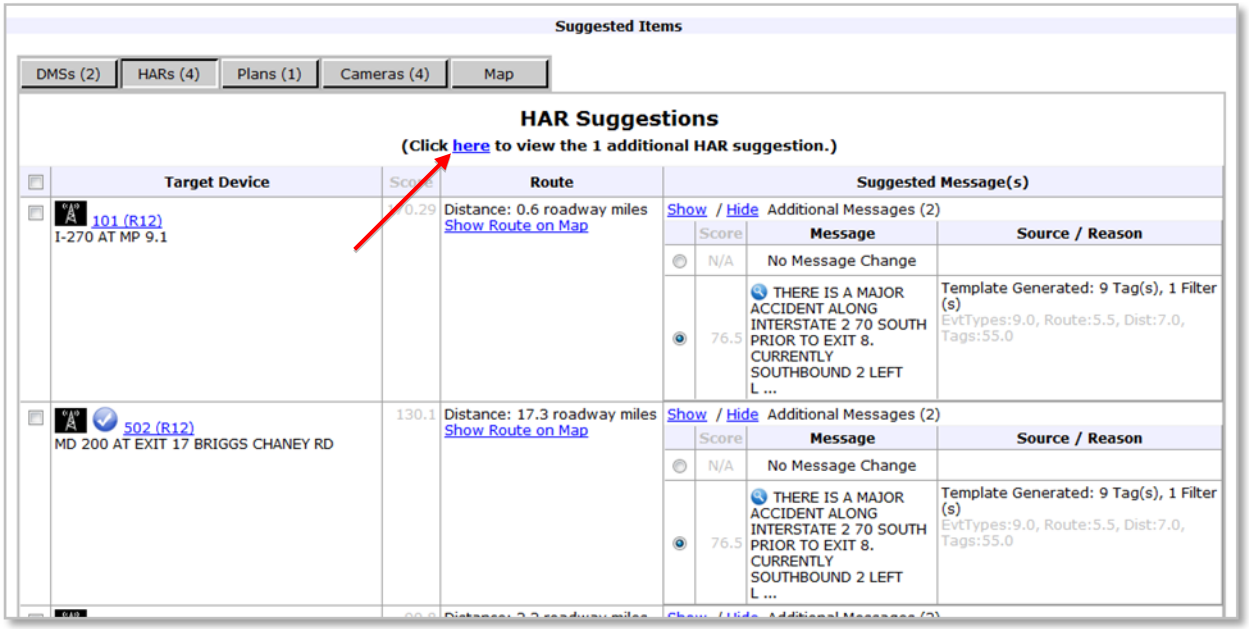


Figure 4-26. The Link to View the Details of Additional Suggested Devices

Additional Suggested Messages

A DMS or HAR may have one or more suggested messages depending on how many applicable templates or plans exist. Messages are listed in order by score with the highest scoring messages appearing first. One exception to this is the No Message Change message option which has no score and is always first in the list. If a suggested device contains more than one suggested message, only the most applicable (or highest scoring) message will be shown in the list. A user may click on the Show Additional Messages link to view the additional suggested messages (see Figure 4-27 below).

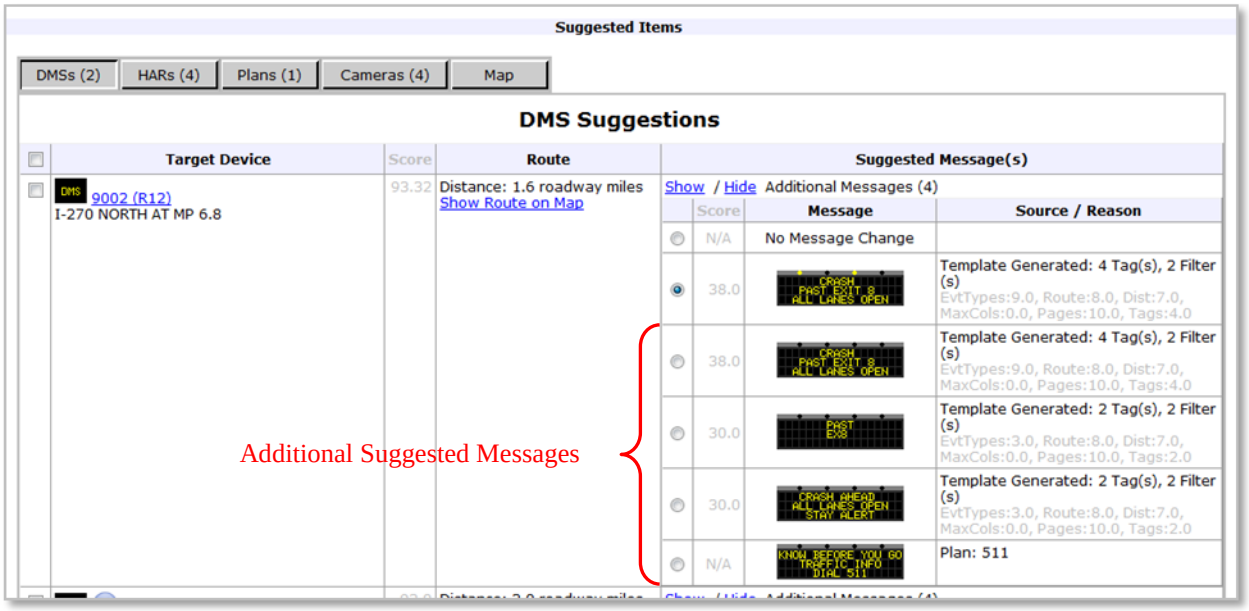


Figure 4-27. Viewing Additional Suggested Messages for a Suggested Device

Source /Reason Details

Templates are suggested based on the tags they contain and a set of configurable factors. Each suggested message will include information about the source and reason the message was suggested. For R12, the route attributes of a suggested device must match the route criteria specified in the template in order for the message to be suggested (see section 4.4.3.7 on Adding a New Device Message Template below for more information). More detailed score information is available by hovering the mouse pointer over the Source / Reason text. A popup will display (see Figure 4-28 below) that shows both the tags that were included in the template and the filters that were used to determine that the message should be suggested.

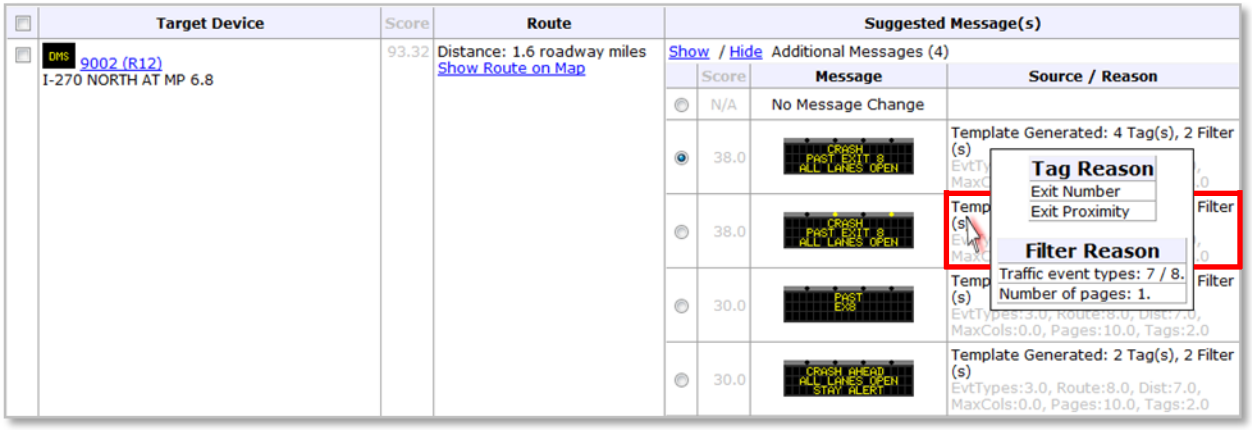


Figure 4-28. Suggested Message Scoring Details

4.4.1.1.2 The Suggested Devices Map View

New for R12 is the Suggestions map (see Figure 4-29 below). A user can view the Suggestions map by clicking on the Map tab. A user can select the map view as their preference for the default view on the suggestions page. User preferences for the suggestions page are described in section 4.4.1.9 on User Preferences for the Suggestions Page below. Suggested devices are grouped by device type (i.e. DMSs, HARs, and Cameras) and listed in order by score with the highest scoring devices appearing first. For each suggested device, the following information is included in the map view: the name, the location on the map, the route from the device to the traffic event on the map, and the driving directions of the route from the device to the traffic event. The in-response icon is visible for each device that is currently in the response plan for the traffic event. No message information is available on the Suggestions map.

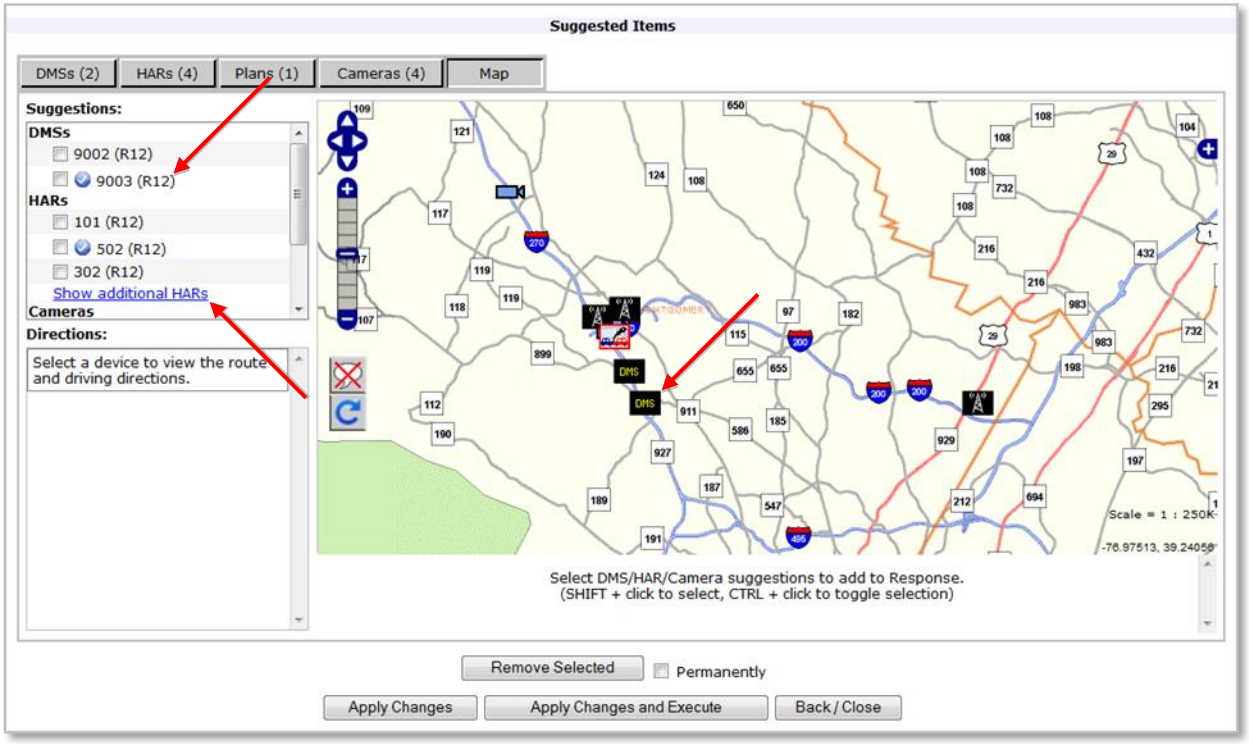


Figure 4-29. Suggested Devices for a Traffic Event Response Plan in the Map View

The route for each device can be viewed by clicking on the device name in the list of suggested devices (see Figure 4-30 below). The map will pan and zoom to show both the device and the traffic event. The device will be highlighted in red and the route will be shown as a red line. Clicking on the device name will also make the driving directions visible in the Directions box in the lower left of the page. Directions are turn-by-turn directions from the device to the traffic event.

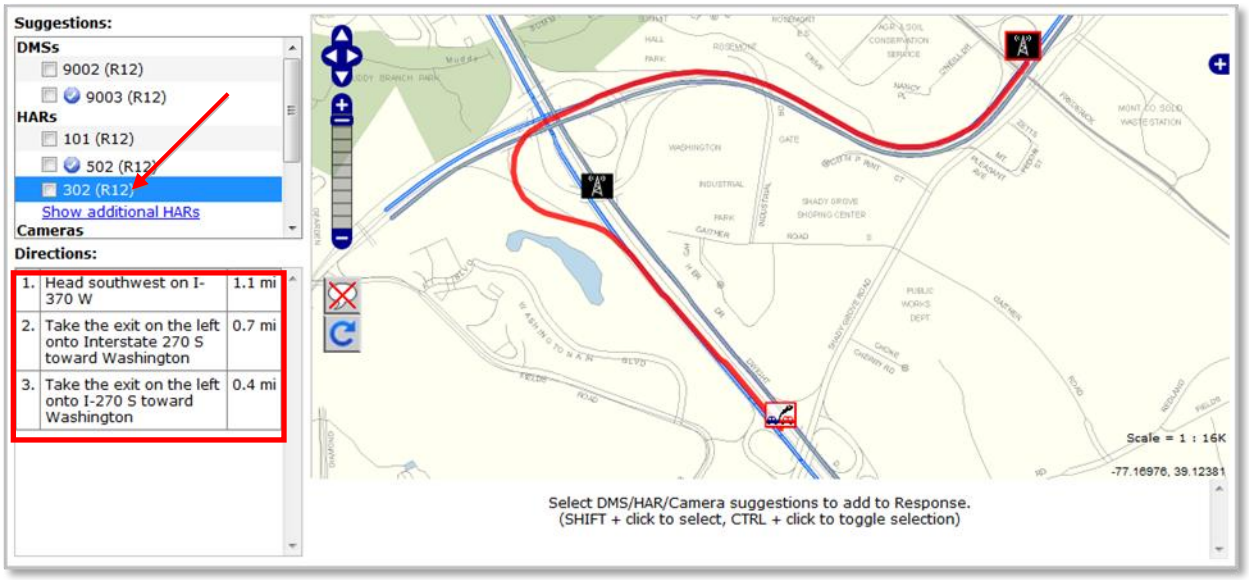


Figure 4-30. The Route from the Suggested Device to the Traffic Event

Additional Suggestions

Initially, only the suggested devices with a score equal to or greater than a configurable cutoff are displayed to the user. A user can click on a link (see Figure 4-29 above) to view the additional suggested devices for that device type. The additional suggested devices will appear at the bottom of the current list of suggested devices for that device type (and become visible on the map).

4.4.1.2 Selecting Suggested Devices and Suggested Messages

Any suggested device may be selected and added to the response plan for the traffic event.

4.4.1.2.1 The Suggestions List View

In the list view, a suggested device can be selected by checking the checkbox next to its name (see Figure 4-31 below). The selected message for the device can be selected by checking the radio button next to the message. Only one message can be selected per device. New for R12 is the No Message Change message option. The No Message Change message option has been added primarily to allow a user to select devices to be added to the response plan from the map. Since the message options are not visible on the Suggestions map, when a user selects a device on the map to add to the response plan the No Message Change message is selected by default. The No Message Change message option can also be selected directly from the list view. Using this message option allows a user to add a suggested device to the response plan with no suggested message. If the device is already in the response plan, no change will be made to the existing message.

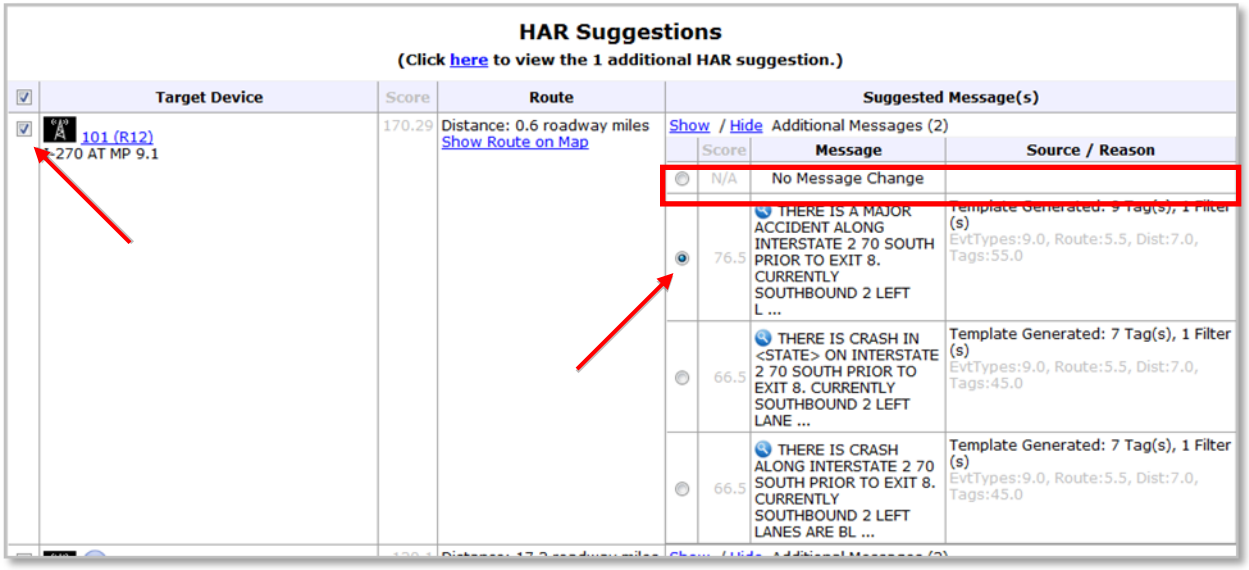


Figure 4-31. Selecting Devices to be Added to the Response Plan in the List View

4.4.1.2.2 The Suggestions Map View

New for R12, suggested devices can be selected from the Suggestions map in the map view (see Figure 4-32 below). Suggested devices can be selected in 2 ways: either directly from the map or from the suggested device list. Any device on the map can be selected by holding down either the Shift key or the Ctrl key and clicking on the device icon. Any device in the device list can be selected simply by checking the checkbox beside the name of the device. Once a device is selected, the device icon on the map will become transparent (to indicate it has been selected), the checkbox beside the device in the device list will be checked, and the name of the device will be appear in the list of selected devices at the bottom of the map. Devices selected in the map view will have the No Message Change message option selected be default (in the list view). A device can be unselected in several ways: directly from the map by holding down the Ctrl key and clicking on the device icon, in the device list by un-checking the checkbox beside the name of the device, or by clicking on the Clear Selections link at the bottom of the map. Clicking on the Clear Selections link will unselect all selected devices.

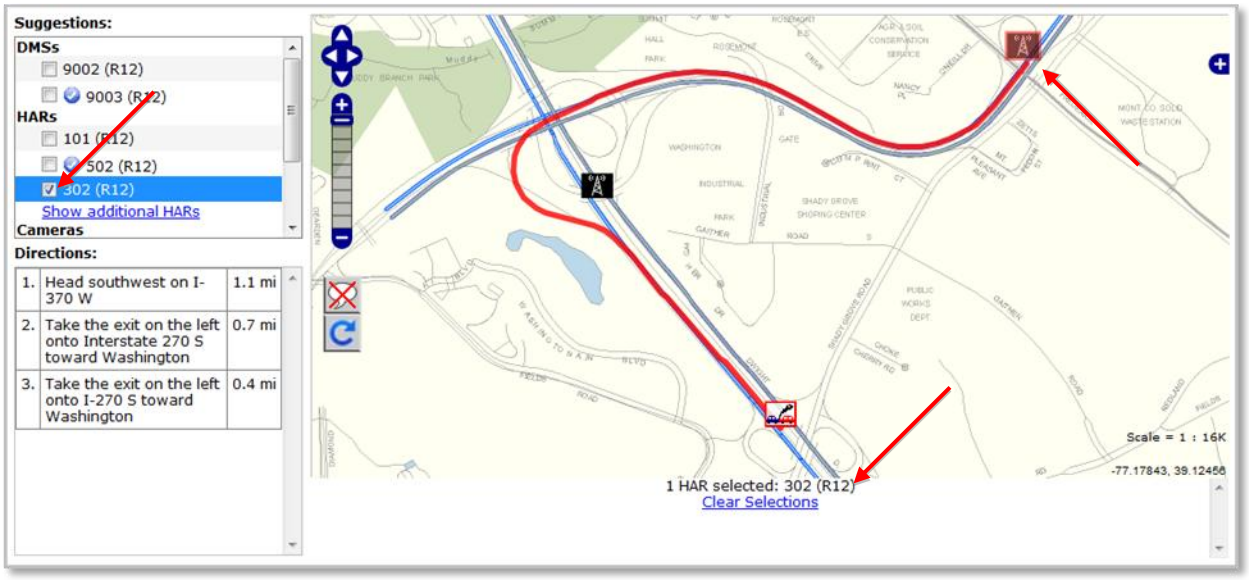


Figure 4-32. Selecting Devices to be Added to the Response Plan in the Map View

4.4.1.2.3 Synchronization between the Suggestions List View and Map View

New for R12, suggested device selections in the list view are synchronized with suggested device selections in the map view (and vice versa). In other words, any time a device is selected (or unselected) in either view the other view is automatically updated to reflect this change. A user can now toggle back and forth between the list view and the map view making changes to device selections and all changes will be reflected in both views. This will allow a user to select devices in the map view and then select messages for those devices in the list view. It will also allow a user to select devices and messages in the list view and then verify the device locations in the map view.

4.4.1.3 Adding Suggested Devices to the Response Plan

With at least one suggested device (and its suggested message if applicable) selected, a user can click on the Apply Changes button (see Figure 4-33 below) to add the selected device(s) to the response plan.

Figure 4-33. Buttons for Adding and Executing Devices in the Response Plan

The selected devices will be added to the response plan with their suggested message (see Figure 4-34 below) or with no message if the No Message Change message option was used, but they will not be executed. A user can click on the Apply Changes and Execute button to not only add the selected devices to the response plan but also execute them as well. A user can select DMSs, HARs, Plans, and Cameras and they will all be added when the user clicks on either the Apply Changes button or the Apply Changes and Execute button.

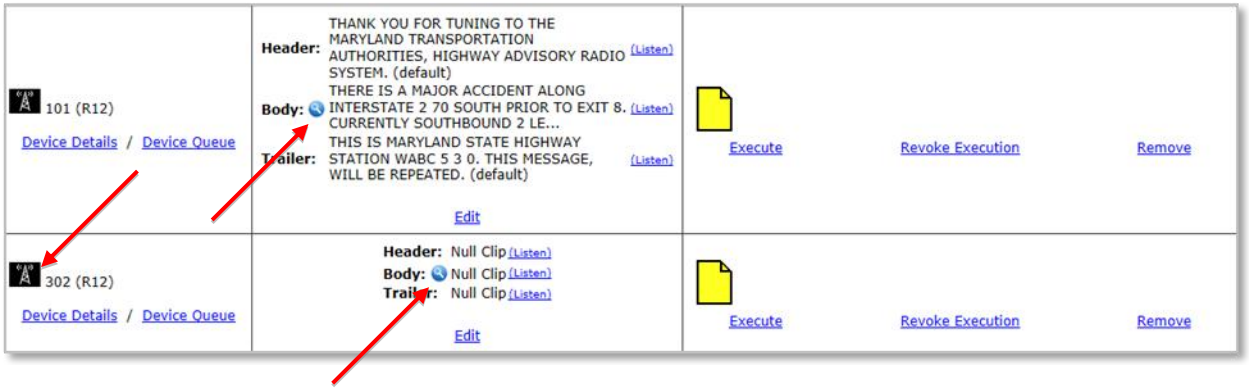


Figure 4-34. Selected Devices Added to the Response Plan with and without a Suggested Message

4.4.1.4 Removing Devices and Suggested Messages from the Suggestion List

A user may choose to remove a device and all of its suggested messages from the suggestion list. With at least one device selected, a user can click on the Remove Selected button (see Figure 4-35 below) to remove the selected devices from the suggestion list. This can be done in either the list view or the map view. If the Permanently checkbox is checked, the device (and its suggested messages) will be removed from the suggestion list until the traffic event is closed or until the user re-activates suggestions for that device. If the Permanently checkbox is not checked, the device (and its suggested messages) will be removed only from the current page. The device will be suggested again the next time any user requests suggestions for the traffic event.

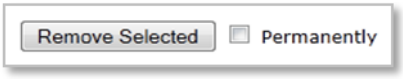


Figure 4-35. Button for Removing Devices from the Suggestions List

4.4.1.5 Viewing the Suggested Plan DMSs and HARs

When a user requests suggested DMSs or HARs from the Response Plan section of the Traffic Event details page (see Figure 4-24 above), each plan that contains one or more of the suggested DMSs or HARs will also be displayed. The Plan DMSs and Plan HARs can be viewed by clicking on the Plan tab at the top of the Suggested Response Actions page (see Figure 4-36 below). The number of DMS and HAR plan items is shown for each Plan in the list. For each suggested plan item (either Plan DMS or Plan HAR), the following information is included in the list view: a description of the plan item, the name and location of the device, the distance and proximity to the traffic event, and a suggested message that comes from the plan. The truncated version of the HAR message is visible on the Plan suggestions tab. A preview of the complete suggested message for each suggested Plan HAR message is available by hovering the mouse pointer over the magnifying glass icon next to the truncated message. New for R12, the in-response icon is visible for each device that is currently in the response plan for the traffic event.

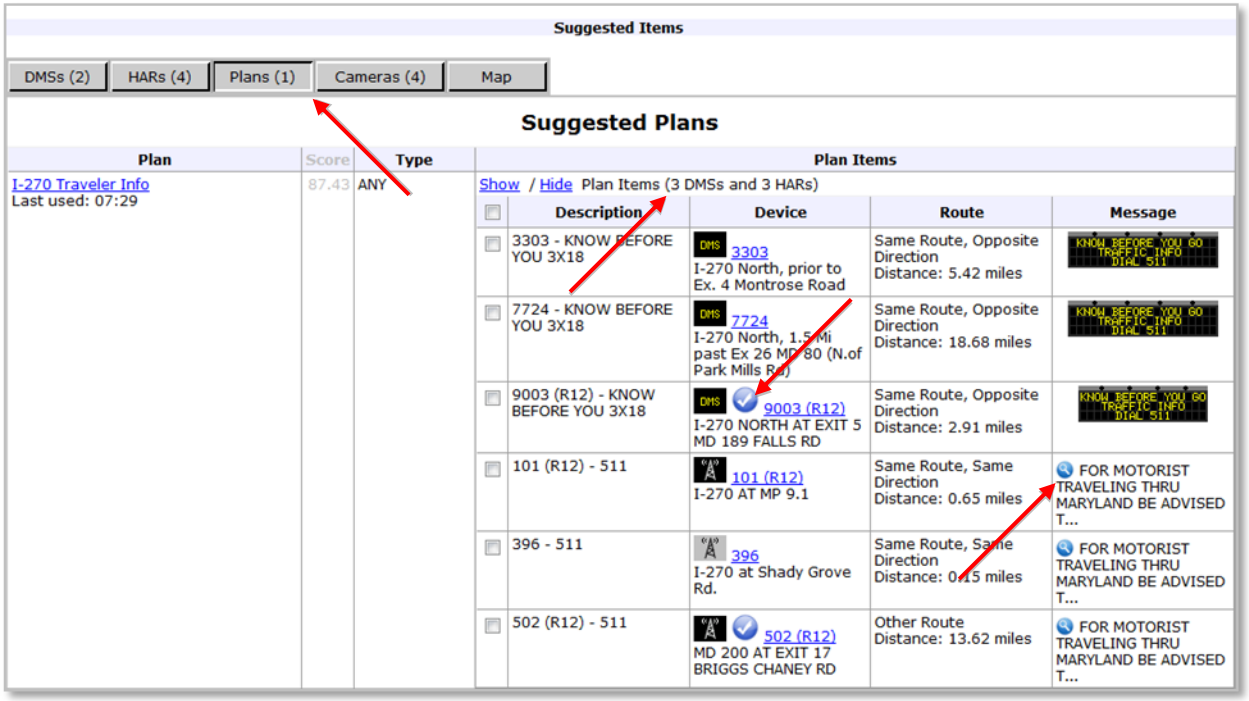


Figure 4-36. Suggested Device Plans for a Traffic Event Response Plan

4.4.1.6 Selecting Plan Devices

Any Plan device may be selected and added to the response plan for the traffic event. The device can be selected by checking the checkbox next to its name (see Figure 4-37).

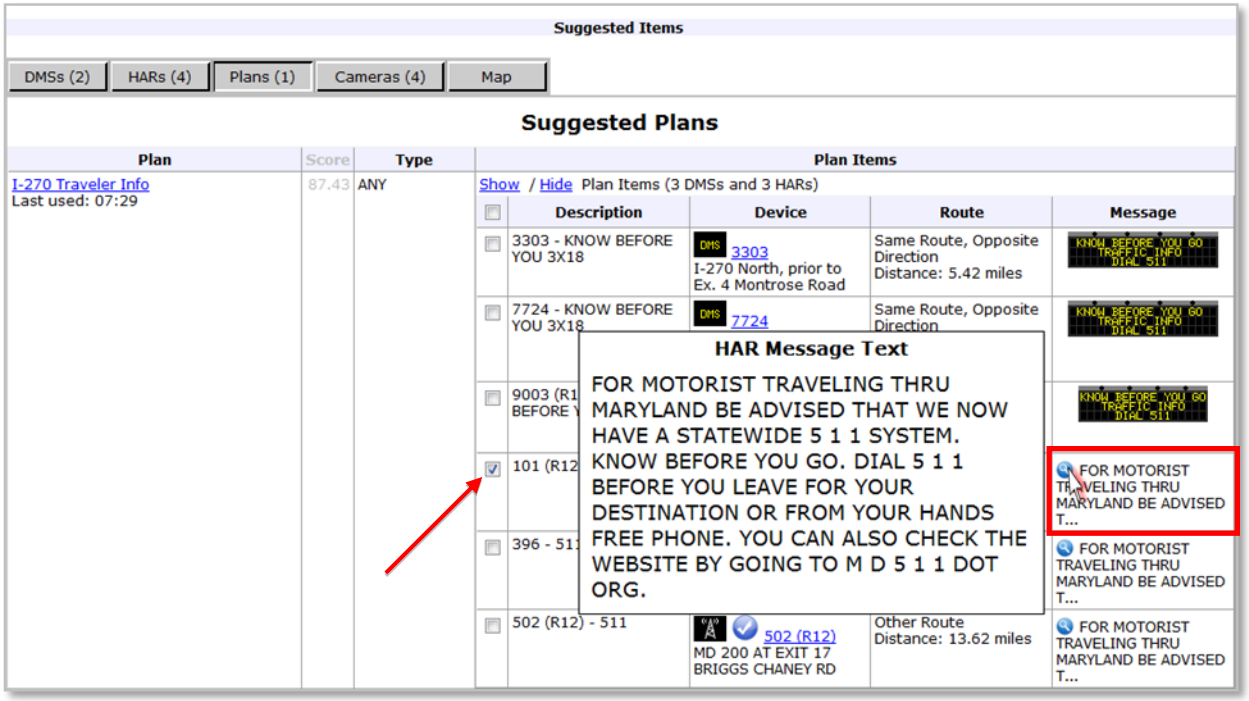


Figure 4-37. Selecting Plan Devices to be Added to the Response Plan

4.4.1.7 Adding Plan Devices to the Response Plan

With one or more device plan items selected, the user can click on the Apply Changes button (see Figure 4-33 above) to add the selected devices to the response plan. The selected devices will be added to the response plan with their plan message, but they will not be executed. A user can click on the Apply Changes and Execute button to not only add the selected devices to the response plan but also execute them as well.

4.4.1.8 Removing Plan Devices from the Suggestion List

A user may choose to remove a Plan from the suggestion list. With at least one device in the Plan selected, a user can click on the Remove Selected button (see Figure 4-35 above) to remove the Plan from the suggestion list. If the Permanently checkbox is checked, the suggested Plan will be removed from the suggestion list until the traffic event is closed or until the user re-activates suggestions for that Plan. If the Permanently checkbox is not checked, the suggested Plan will be removed only from the current view. This implies that the Plan will be suggested again the next time the user requests suggestions for the traffic event.

4.4.1.9 User Preferences for the Suggestions Page

New for R12, the default view and scoring information visibility can be configured per user on the decision support Suggestions page. A user can click on the Set Display Preference link near the top of the page to view the Display Preference callout (see Figure 4-38 below).

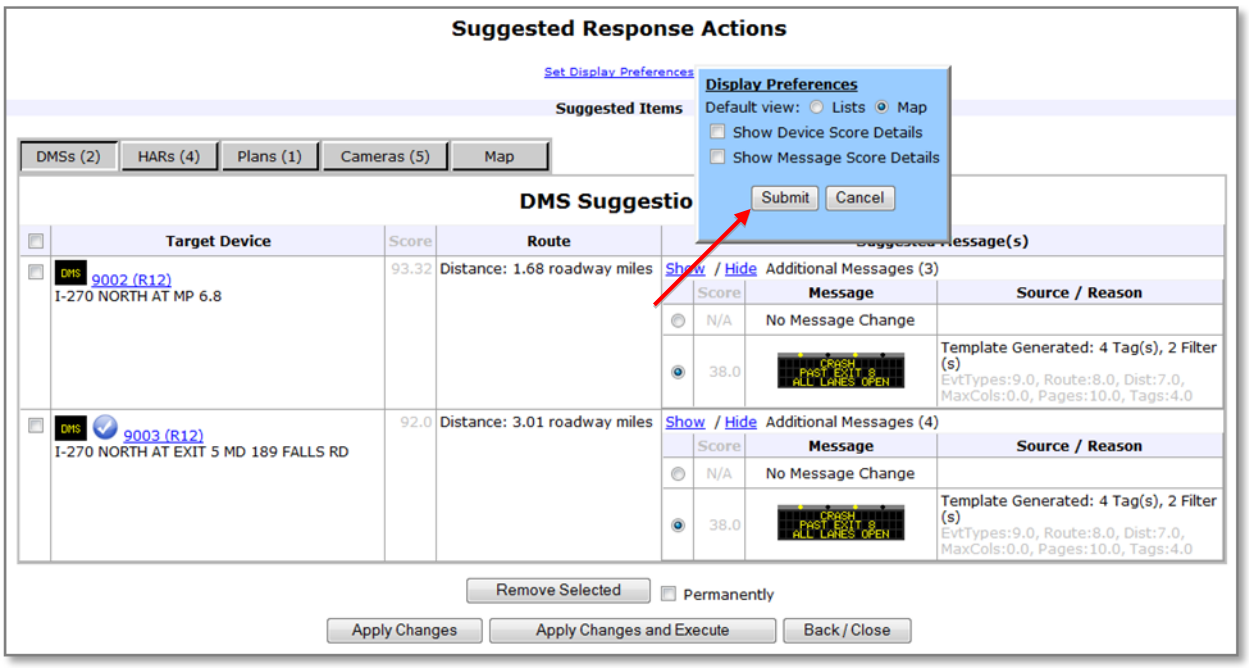


Figure 4-38. Setting the User Preferences for the Suggestions Page

The default view can be set to either Lists or Map. When the Suggestion page is first displayed (after a user requests suggestions for a traffic event), the tab that is visible will depend on the default view specified in the user preferences. The visibility of Device Score Details and Message Score Details can also be configured. When the updated display preferences are submitted, the Suggestions page is reloaded and displayed based on the new settings. By un-checking the Show Device Score Details and Show Message Score Details checkboxes, the Score column for both the device and the messages can be hidden (see Figure 4-39). The score information in the Source / Reason column will be hidden as well.

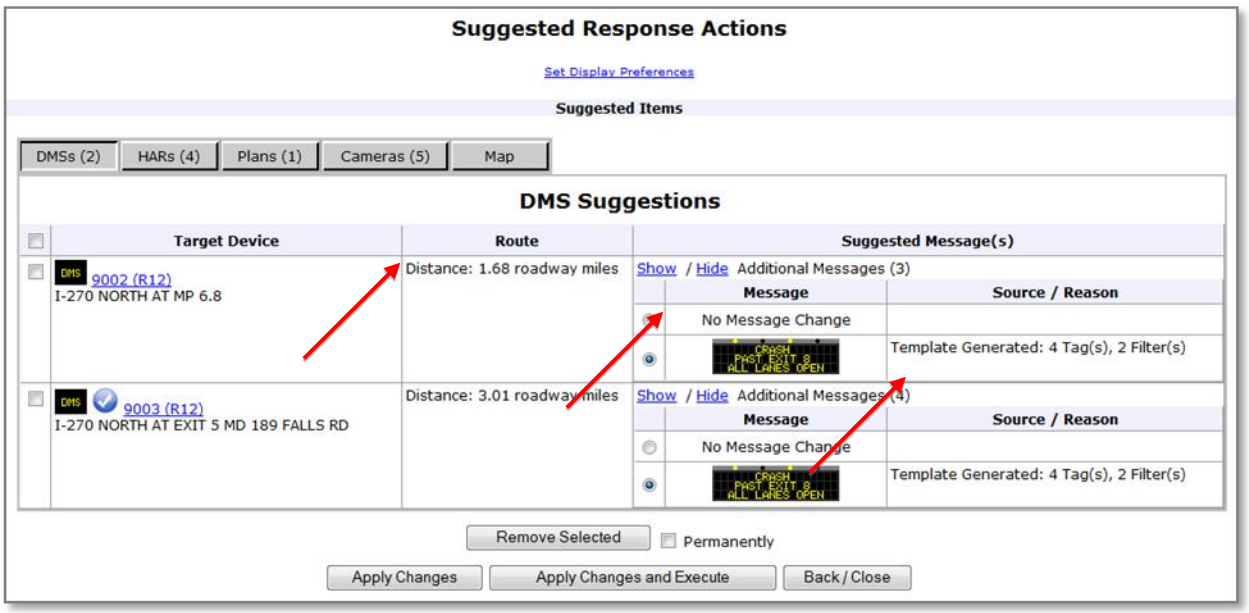


Figure 4-39. The Suggestions Page with No Scoring Information Visible

4.4.1.10 Getting Suggestions for Additional Recommended Devices

If there are recommended devices (either DMS or HAR) that have not been added to the response plan, a warning will appear (see Figure 4-40 below) at the bottom of the response plan section of the traffic event details page. A DMS will be considered "recommended" if it is on the same route as the traffic event, within the configurable distance, and there are no turns in the route from the DMS to the traffic event. A HAR will be considered "recommended" if it is within the immediate distance or if it is on the same route as the traffic event, within the configurable distance, and there are no turns in the route from the HAR to the traffic event.

Figure 4-40. The Link to View Additional Recommended Devices

A user can click on this link to see the recommended devices (DMSs and HARs) that are not in the response plan (see Figure 4-41).

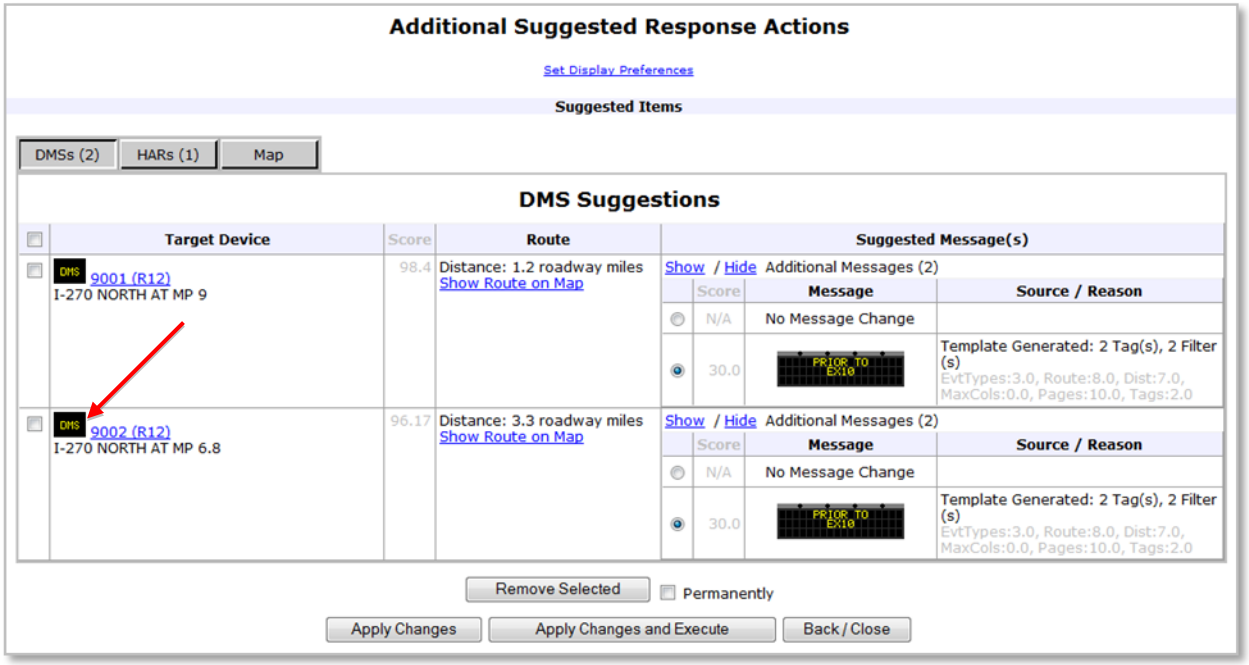


Figure 4-41. Additional Recommended Devices Suggested for the Response Plan

4.4.1.11 Warning About DMSs That Are Not Recommended

If there are DMSs in the response plan that are not recommended, a warning will appear (see Figure 4-42 below) at the bottom of the response plan section of the traffic event details page. A DMS will be considered "not recommended" if it is on the same route as the traffic event, is within the configurable distance, and contains a U-turn in the route from the DMS to the traffic event. Each DMS in the response plan that is not recommended will also have the Not Recommended icon ⚠ and will be highlighted in red (see Figure 4-43 below).

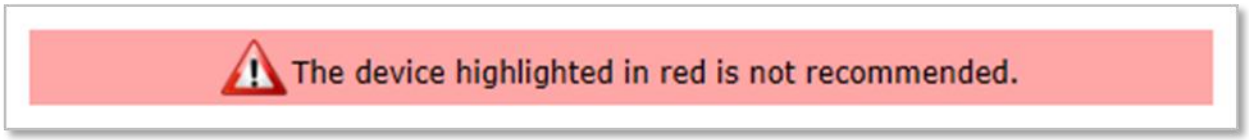


Figure 4-42. Not Recommended Devices Warning

4.4.1.12 Getting Suggested Messages for Devices in the Response Plan

With at least one device (either DMS or HAR) in the response plan, a user can request message suggestions (see Figure 4-43) for either all devices in the response plan or devices in the response plan with a blank message.

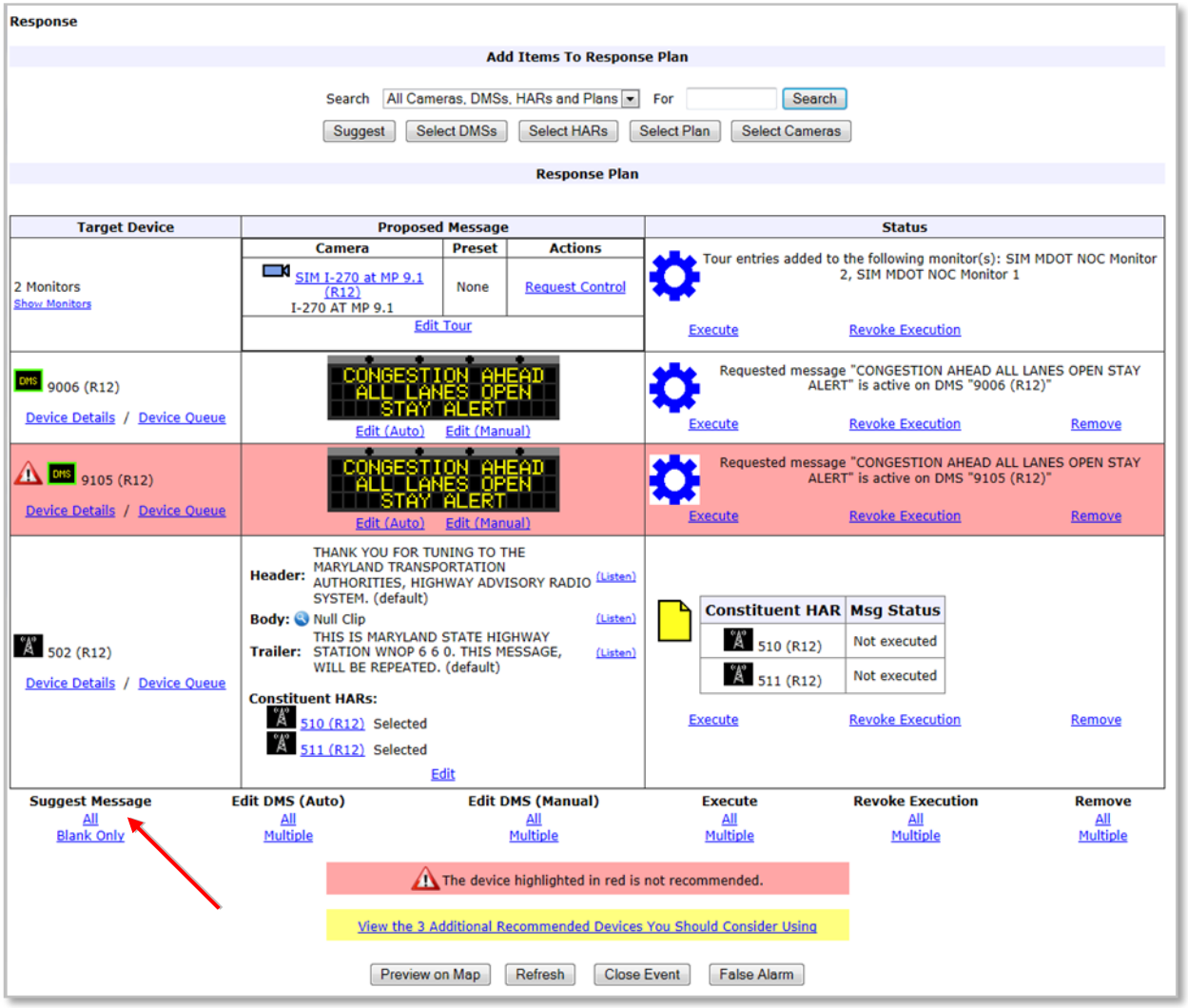


Figure 4-43. Getting Suggested Messages for Devices in the Response Plan

A user can click on the Suggest Messages for All links to get suggested messages for all devices (DMSs and HARs) in the response plan even if the device was not originally suggested for this traffic event (see Figure 4-44 below). A user can click on the Suggest Messages for Blank Only link to get suggested messages for all devices in the response plan with a blank message.

Figure 4-44. Suggested Messages for All Devices in the Response Plan

4.4.1.13 Getting Suggested Messages After Updating Lane Closures

When the lane closures for a traffic event are updated (either by changing lane closures or by changing the lane configuration), the Suggest Response Message button (see Figure 4-45 below) in the Roadway Conditions section will be highlighted to remind the user to update suggested messages. This will give the user an opportunity to a) add suggested devices due to lanes closing, b) remove devices suggested to be removed due to lanes opening, or c) update device messages based on the new suggested message for the device.

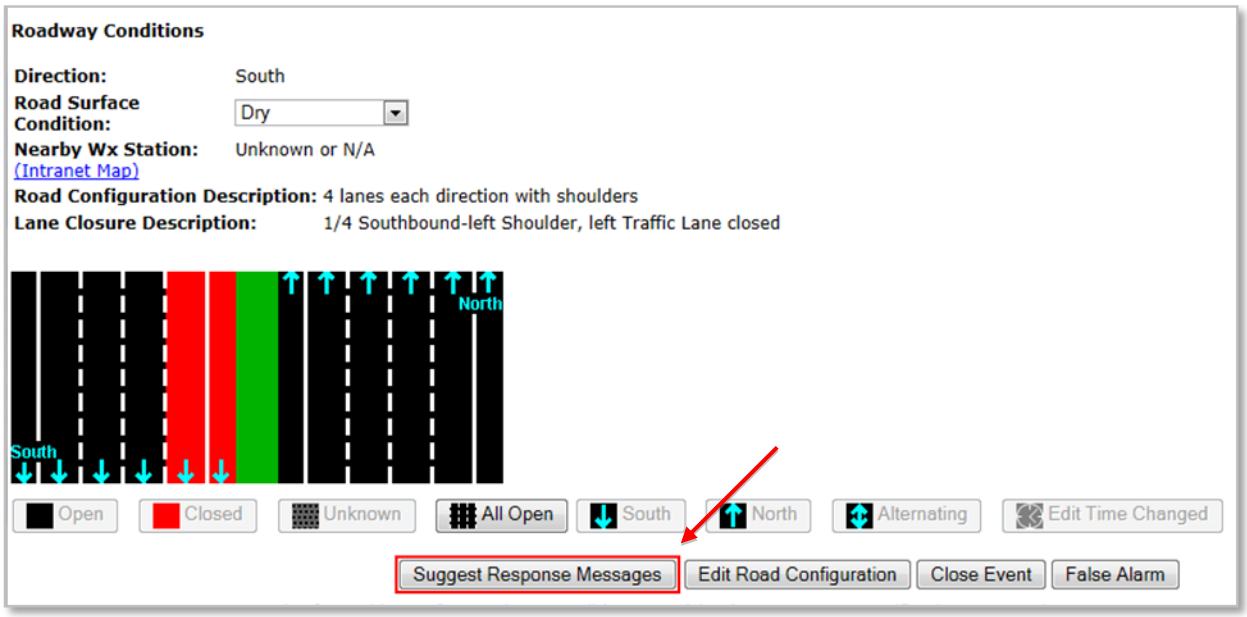


Figure 4-45. Suggested Response Messages Button in the Roadway Conditions Section

4.4.1.14 Devices Suggested to be Removed from the Response Plan

When a user requests suggestions, the typical result is to get a list of devices that are recommended to be added to the response plan. Under some circumstances, the system may suggest a list of devices (DMSs, HARs, and cameras) that should be removed (or revoked) from the response plan (see Figure 4-46 below). This typically occurs when the lane closures for a traffic event are cleared. The default action for a DMS or HAR that is recommended to be removed from the response plan is to revoke the device. A user can select to revoke or remove each suggested DMS or HAR. Cameras can only be removed from the response plan.

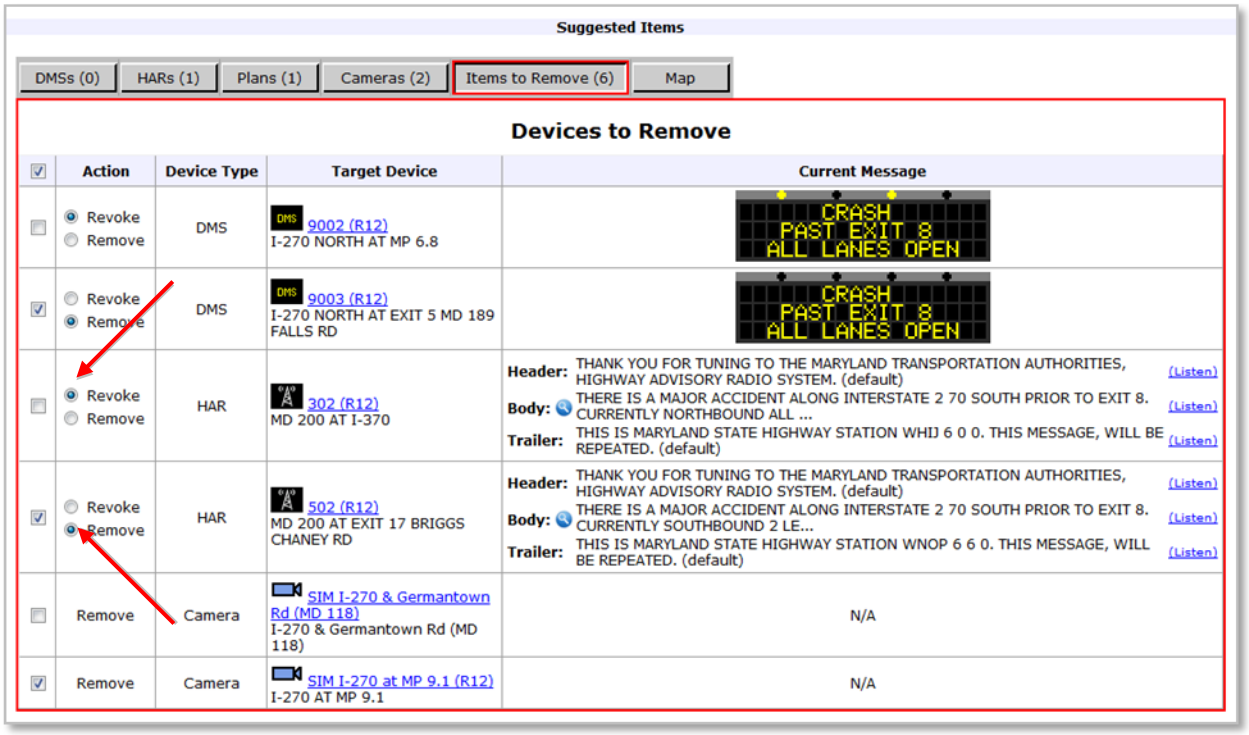


Figure 4-46. Devices Suggested to be Removed from a Traffic Event Response Plan

4.4.1.15 Response Plan Preview Map

A user may view a preview of the current response plan on the map by clicking the Preview on Map button (see Figure 4-47 below) at the bottom of the response plan section on the traffic event details page.

Figure 4-47. Button for Viewing a Preview of the Response Plan on a Map

The response plan preview map will contain all of the devices (DMSs and HARs) in the response plan, as well as the additional suggested devices that are not currently in the response plan (see Figure 4-48 below). The additional suggested devices will be highlighted in yellow on the map. Any DMSs in the response plan that are not recommended will be highlighted in red on the map.

A legend indicating that devices with yellow highlighting are recommended and that devices (DMSs only) with red highlighting are not recommended appears just below the map. The callouts for the devices in the response plan will show the current message (or blank if no message has been configured). The callouts for the additional suggested devices will show a blank message.

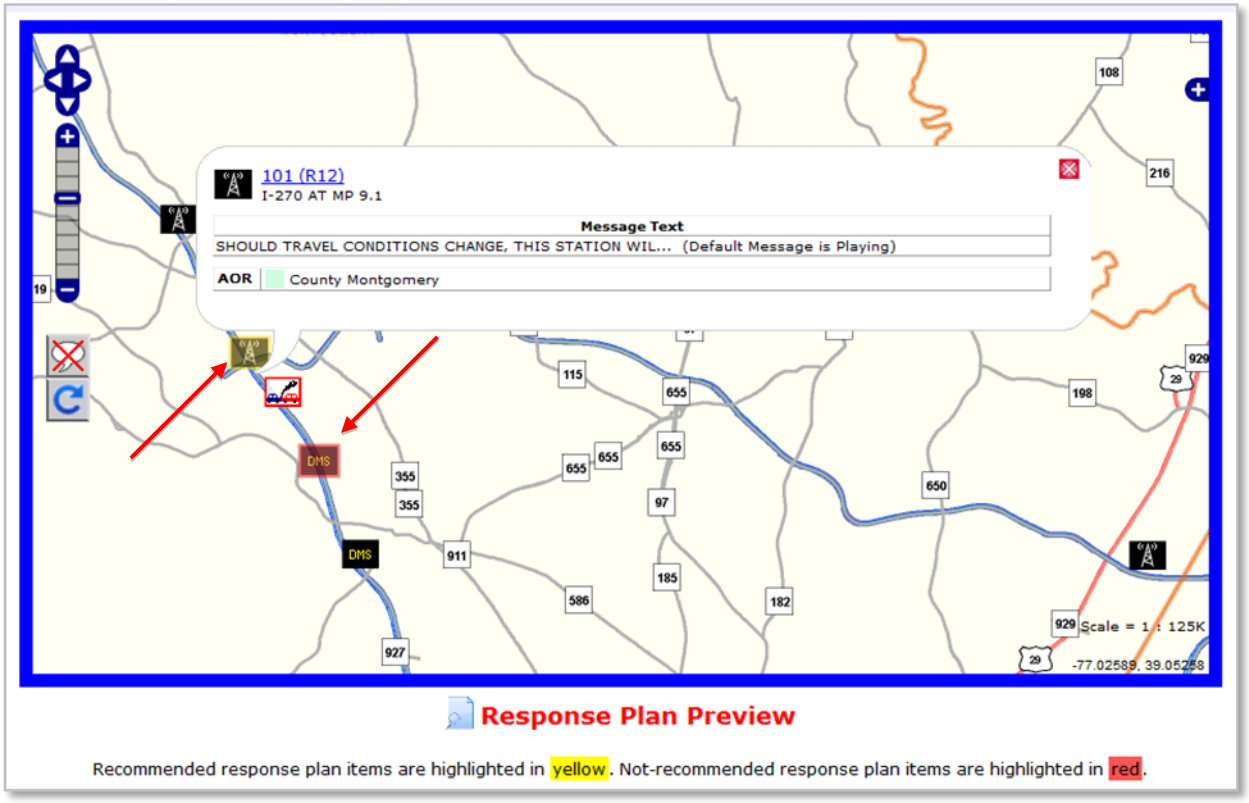


Figure 4-48. Response Plan Preview Map Showing Recommended and Not Recommended Devices

The DMSs on the Response Plan Preview map will be shown on 2 layers (see Figure 4-49 below). The DMSs layer will contain all DMSs that are currently in the response plan (including DMSs that are currently in the response plan but are not recommended). The DMSs (Recommended) layer will contain DMSs that are not currently in the response plan but are recommended. The HARs on the Response Plan Preview map will be shown on 2 layers. The HARs layer will contain HARs that are currently in the response plan. The HARs (Recommended) layer will contain HARs that are not currently in the response plan but are recommended. A user may show or hide any of these layers by clicking on the checkbox next to the layer name.

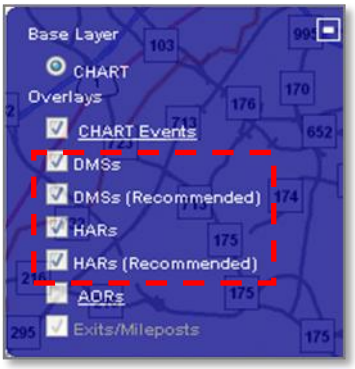


Figure 4-49. Response Plan Preview Map Layer Switcher Showing Device Layers

4.4.2 Configuring Devices to be Decision Support Eligible

A device (DMS, HAR, or camera) or plan can be configured to be decision support eligible by setting its Decision Support Eligible flag to true (see Figure 4-50 and Figure 4-51 below). In R12, cameras can be configured to be decision support eligible. Only devices and plans that are eligible for decision support will be considered when suggesting actions for the response plan of a traffic event. A synchronized HAR will only be considered for decision support if the synchronized HAR and all of its constituents are configured to be decision support eligible.

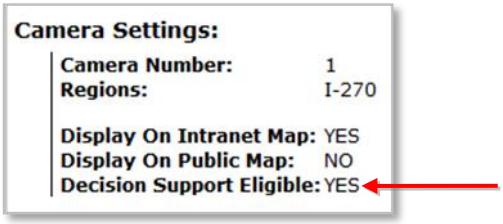


Figure 4-50. Decision Support Eligible Setting for a Camera

The Decision Support Eligible flag for a camera can be edited by clicking on the Edit Configuration link to view the configuration page. The user can then click on the Decision Support Eligible checkbox (see Figure 4-51 below) to change its value and click on the OK button to save the changes.

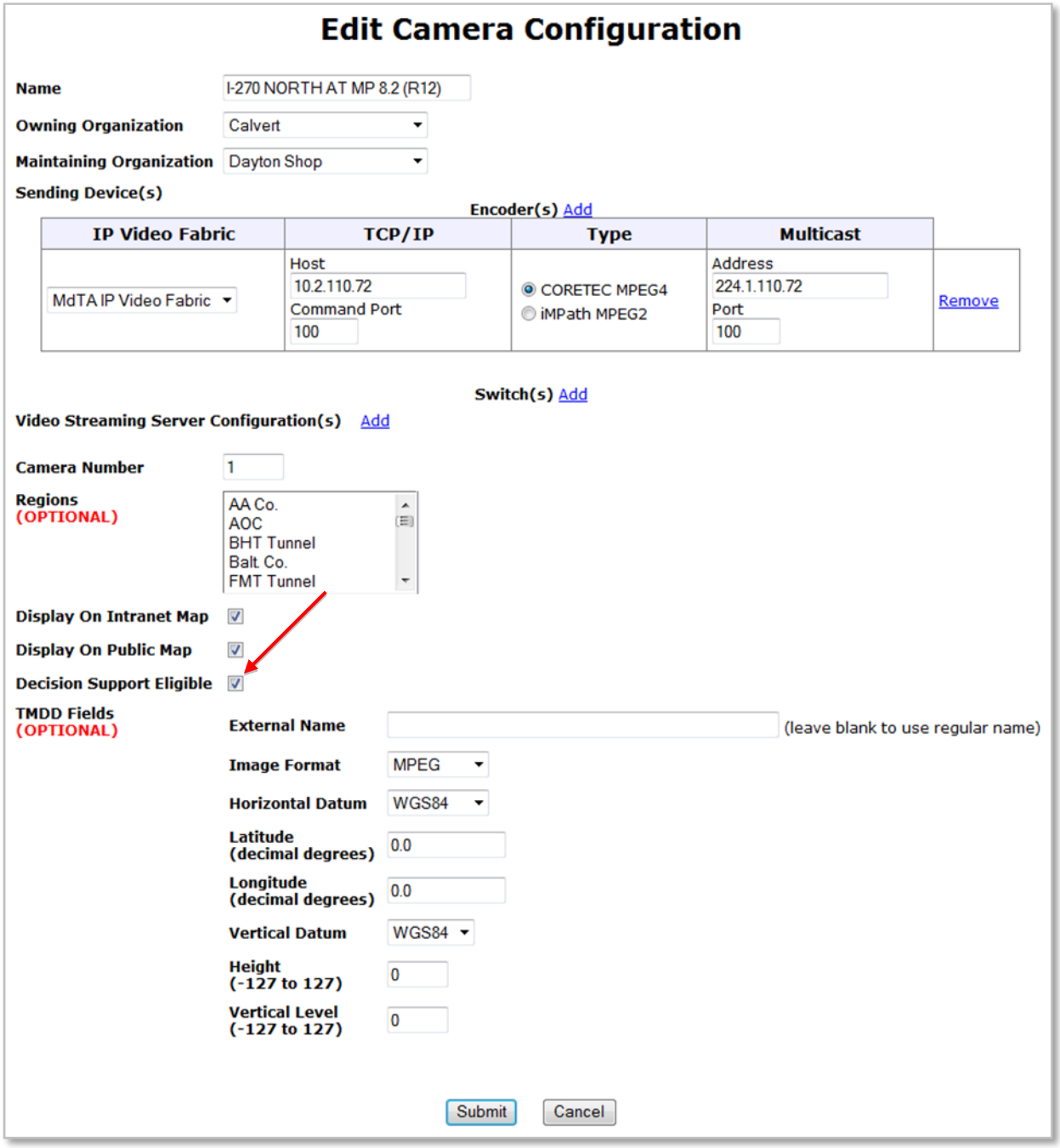


Figure 4-51. Editing the Decision Support Eligible Setting for a Camera

4.4.3 Configuring Decision Support Settings

The criteria for suggesting devices includes: the type of traffic event, the distance from a device to the traffic event, the lane closures for the traffic event, the characteristics of the route from a device to the traffic event, and the tags in the message template. Factors relating to each of these criteria are configurable. From the System Setting page (in the System Profile), a user may view

any of the Decision Support configuration pages (see Figure 4-52 below). Settings for each device type (DMS, HAR, and camera) can be configured separately.

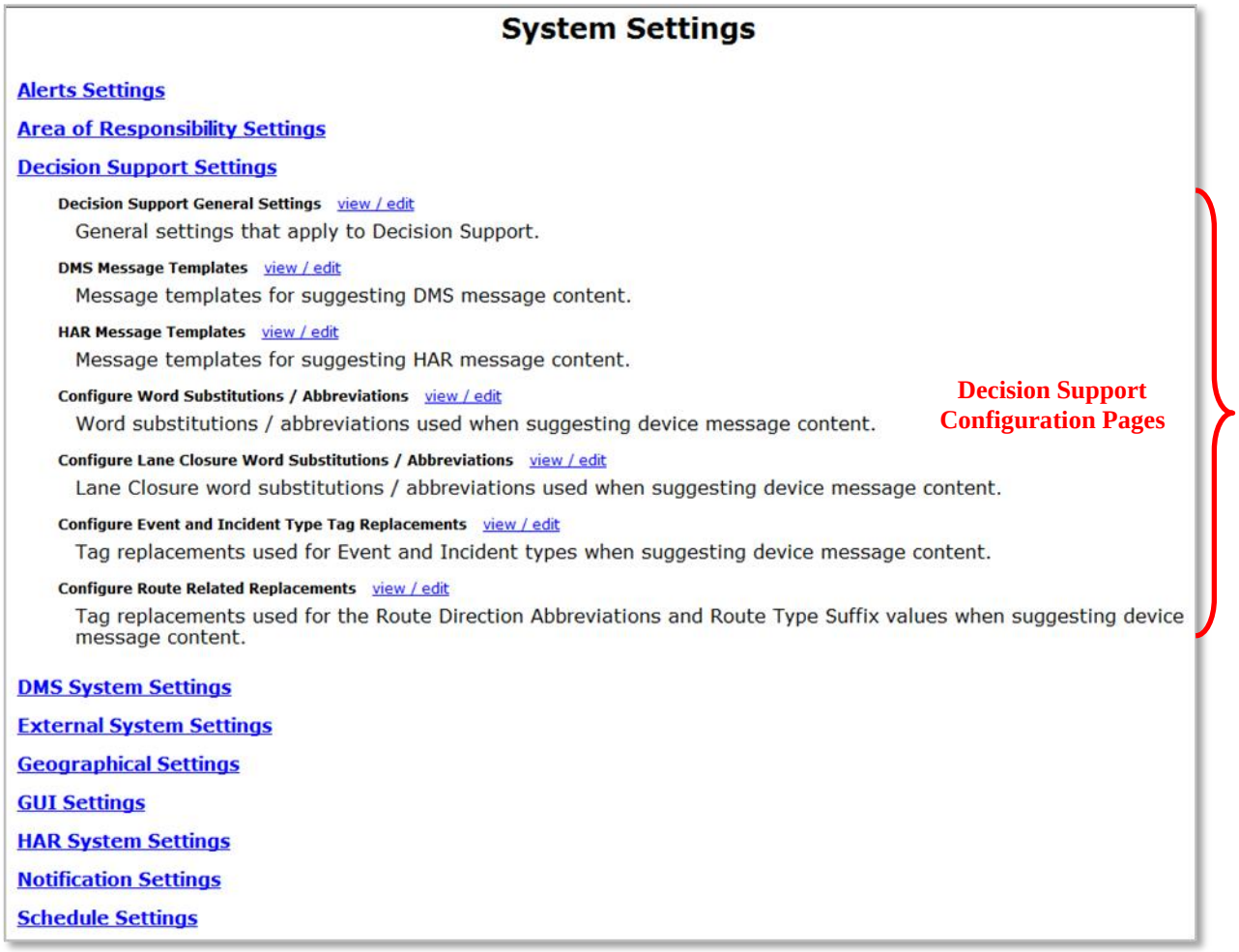


Figure 4-52. Decision Support Configuration Settings Pages

4.4.3.1 General Settings

The Decision Support General Setting pages contain configuration settings for distance, route characteristics, and route type. These settings are used when determining if a device (or a device message template in the case of DMSs and HARs) should be suggested for a traffic event. A user can edit the distance, route characteristics, and route type values (either by entering a new number value or clicking on a checkbox) and save the form by clicking on the Save Changes button. There are separate settings for DMSs, HARs, and cameras. The route type setting is not applicable to cameras.

4.4.3.2 Enabling/Disabling Device and Plan Suggestions

Device types can be enabled or disabled for decision support (see Figure 4-53 below). If the device type is enabled, suggestions for that type of device will be generated when a user requests

decision support suggestions for a traffic event. If the device type is disabled, devices of that type will be ignored for all features of decision support. Plans can also be enabled or disabled for decision support. If plans are enabled, suggestions will be generated for DMS plan items and HAR plan items when a user requests decision support suggestions for a traffic event; otherwise, they will not.

Figure 4-53. Enabling/Disabling Device Suggestions

4.4.3.3 Configuring Distances

When a user requests device suggestions, the method of determining whether a device should be suggested is partly based on the distance of the device from the traffic event and the percentage of lane closures for the traffic event. A user may configure the 3 maximum distances (in miles) - one for each of the 3 distance types: Immediate, Near, and Far (see Figure 4-54 below) - by entering a new value in the textbox. A user may also configure a lane closure percentage for 2 of the 3 distance types (Immediate and Near) by entering a new value in the textbox. These settings are used in the following way to determine whether a device should be suggested for a traffic event. First, the percentage of lane closures for the traffic event is determined. Next, the furthest applicable distance type is determined based on the percentage of lane closures for the traffic event and the configured lane closures percentage. If the distance from the device to the traffic event is less than the configured maximum distance for the distance type, the device is considered a valid suggestion.

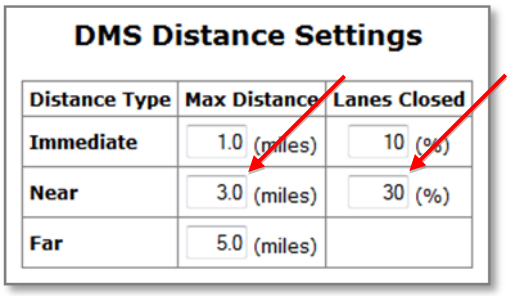


Figure 4-54. Distance Settings Form Showing the Maximum Distances and the Percentage of Lanes Closed

4.4.3.4 Configuring Route Settings

When a user requests suggestions, the method of determining whether a device should be suggested is partly based on the attributes of the route between the device and the traffic event. The route between a device and a traffic event has the following attributes: the number of turns in the route, the presence of a U-turn in the route, the type of routes in the route. New for R12, a

user may configure the following route settings (see Figure 4-55 below): the maximum number of turns in the route supported, whether a U-turn in the route is supported, and the route types in the route that are supported. In order for a device to be suggested, the route attributes must not conflict with the route settings. In other words, a) the route must not contain more turns than the maximum number of turns configured in the route settings, b) the route must not contain a U-turn unless the route settings are configured to allow a U-turn in the route, and c) the route must not contain any route types that are not allowed by the route settings. If the route attributes conflict with the route settings, that device will not be considered a valid suggestion.

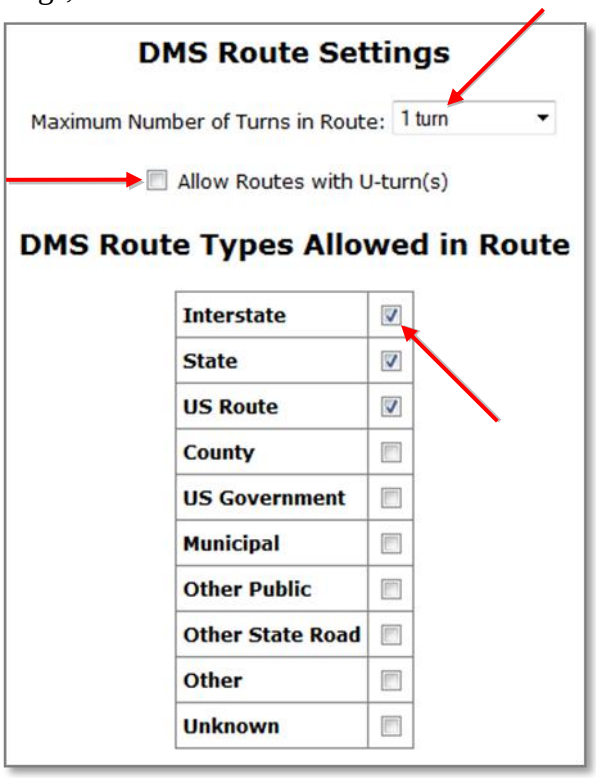


Figure 4-55. The Decision Support Route Settings for a Device

4.4.3.5 Configuring Route Types

When a user requests suggestions, the method of determining whether a message template should be suggested for a device is partly based on the route type of the traffic event and the route tags (Route Type, Route Number, Route Name, Exit Road Type, Exit Road Number, and Exit Road Name) in the template message. A user may configure the applicable route types by clicking on the checkbox beside each route type name (see Figure 4-56 below). For each route type, the Route Type / Number and Route Name may be configured separately. If the Route Type / Number checkbox is not checked for the route type of a traffic event and a Route Type, Route Number, Exit Road Type, or Exit Road Number tag exists in a message template, that template will not be suggested for that device. Likewise, if the Route Name checkbox is not checked for the route type of a traffic event and a Route Name or Exit Road Number tag exists in a message template, that template will not be suggested for that device.

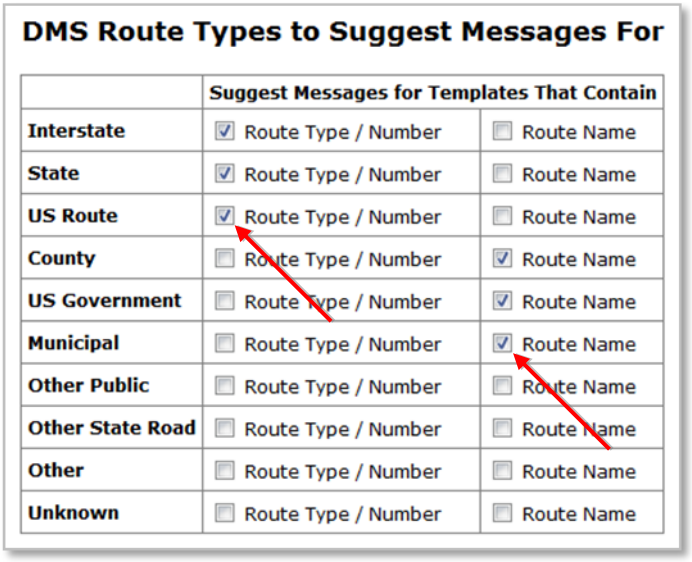


Figure 4-56. The Route Types Settings Showing the Route Types to Suggest Messages For

4.4.3.6 Configuring Device Message Templates

Message suggestions for a device are based on a configured list of device Message Templates (see Figure 4-57 below). Each template contains a message, a list of applicable event types, a list of applicable distances, and route settings. DMS message templates also contain a setting for the maximum sign width of the DMS (as the number of columns).

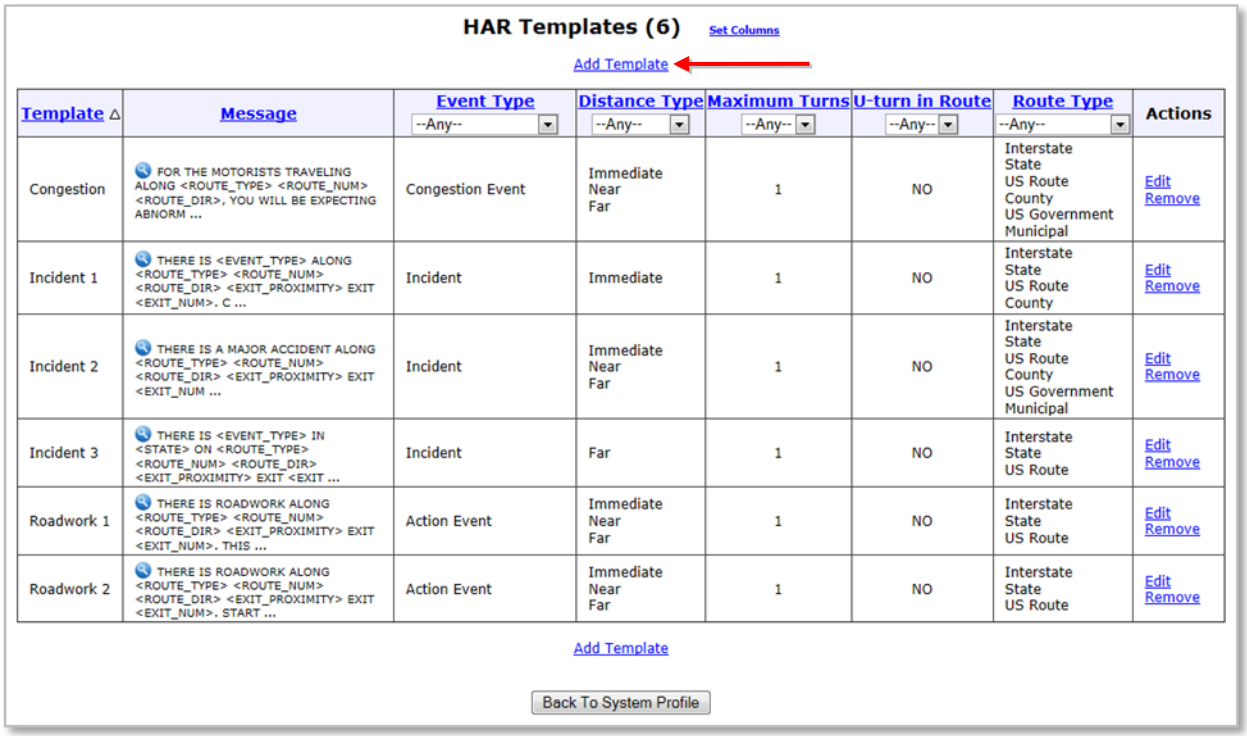


Figure 4-57. The Decision Support HAR Message Template List Page

4.4.3.7 Adding a New Device Message Template

A user can create a new template by clicking on the Add Template link on the appropriate device message template list page (either DMS or HAR) which will open the template editor. The user then must configure the message, applicable traffic event types, applicable distances, route settings, and template name. For a DMS message template, the user must also configure the maximum sign width of the DMS (as the number of columns). Once all values have been entered, the user can click on the OK button to save the template.

Template Message

The template message is composed of tags and user entered text (see Figure 4-58 below). The available tags include: Event Type, Incident Type, Route Type, Route Number, Route Name, Route Direction, Proximity to Exit, Exit Number, Exit Road Type, Exit Road Number, Exit Road Name, Distance (miles), and Lane Closures. When a suggested message is created using a message template, the tags are replaced with values from the traffic event. If there is no data from the traffic event for one or more of the tags in the message template, the suggested message will not be created.

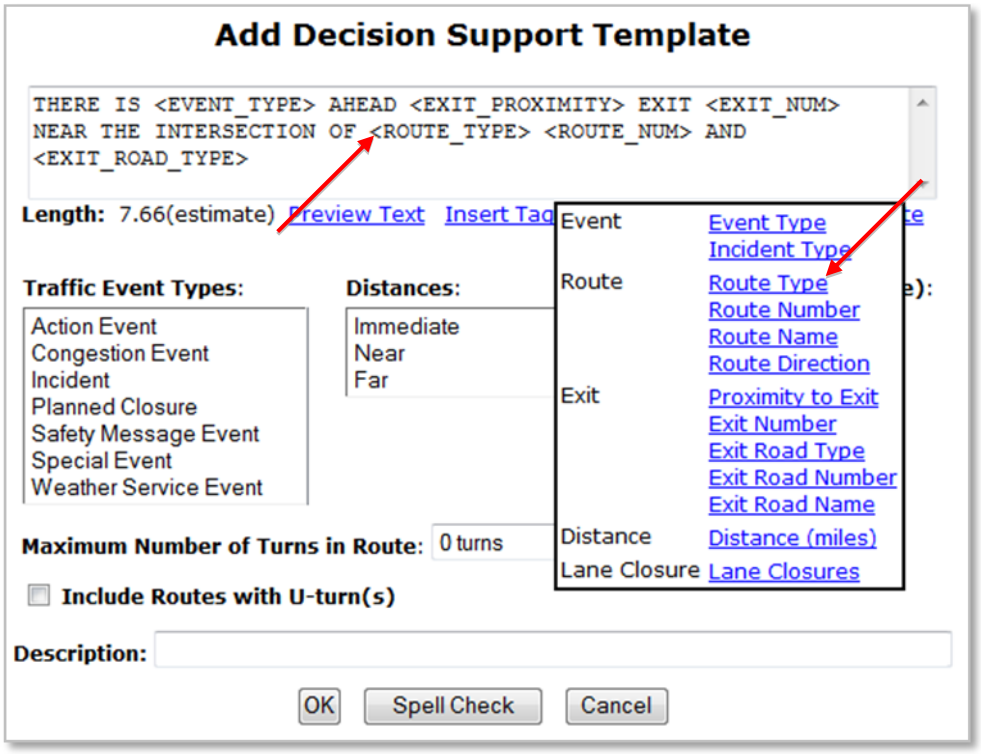


Figure 4-58. The HAR Message Template Editor with the Tag Selector Popup Displayed

Applicable Traffic Event Types

A user must select one or more traffic event types that are applicable to this template (see Figure 4-59 below). Suggested messages created using a message template will only be created for events that match one of the applicable traffic event types.

Applicable Distances

A user must select one or more distances that are applicable to this template (see Figure 4-59 below). Suggested messages created using a message template will only be created when the distance of the device from the traffic event is less than or equal to one of the configured maximum distances for one of the applicable distances.

Maximum Number of Turns in the Route

A user must select the maximum number of turns in the route from the device to the traffic event (see Figure 4-59 below). Suggested messages created using a message template will only be created for an event if the number of turns in the route is less than or equal to the maximum number of turns configured in the message template. The maximum number of turns in the route can be configured as: 0 turns, 1 turn, 2 turns, 3 turns, 4 turns, 5 turns, or No Maximum.

Include Routes with U-turns in the Route

A user must select whether a U-turn is allowed in the route from the device to the traffic event (see Figure 4-59 below). Suggested messages created using a message template will only be created for an event if either the route does not contain a U-turn or the message template is configured to allow a U-turn in the route.

Applicable Route Types in the Route

A user must select one or more route types that are applicable to this template (see Figure 4-59 below). Suggested messages created using a message template will only be created for traffic events with a route that contains only route types that are specified in the list of applicable route types. In other words, if the route for the traffic event contains any route types that are not specified in the list of applicable route types the template will not be used to generate a suggested message.

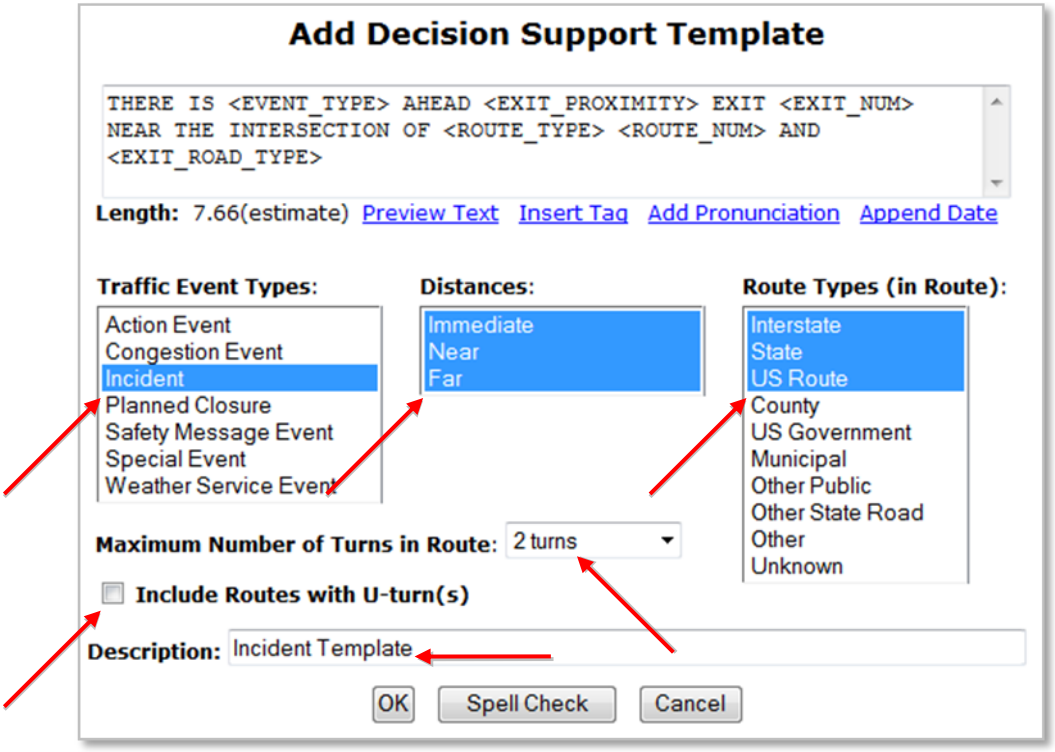


Figure 4-59. The HAR Message Template Editor With All Values Set

4.4.3.8 Configuring the Word Substitution/Abbreviation List

A user may configure word substitutions (or abbreviations) that are used when generating a suggested message from a device message template (see Figure 4-60 below). The substitutions are used to replace values from the traffic event that are replacing tags in the device message template. The substitutions are not used to replace text entered by the user.

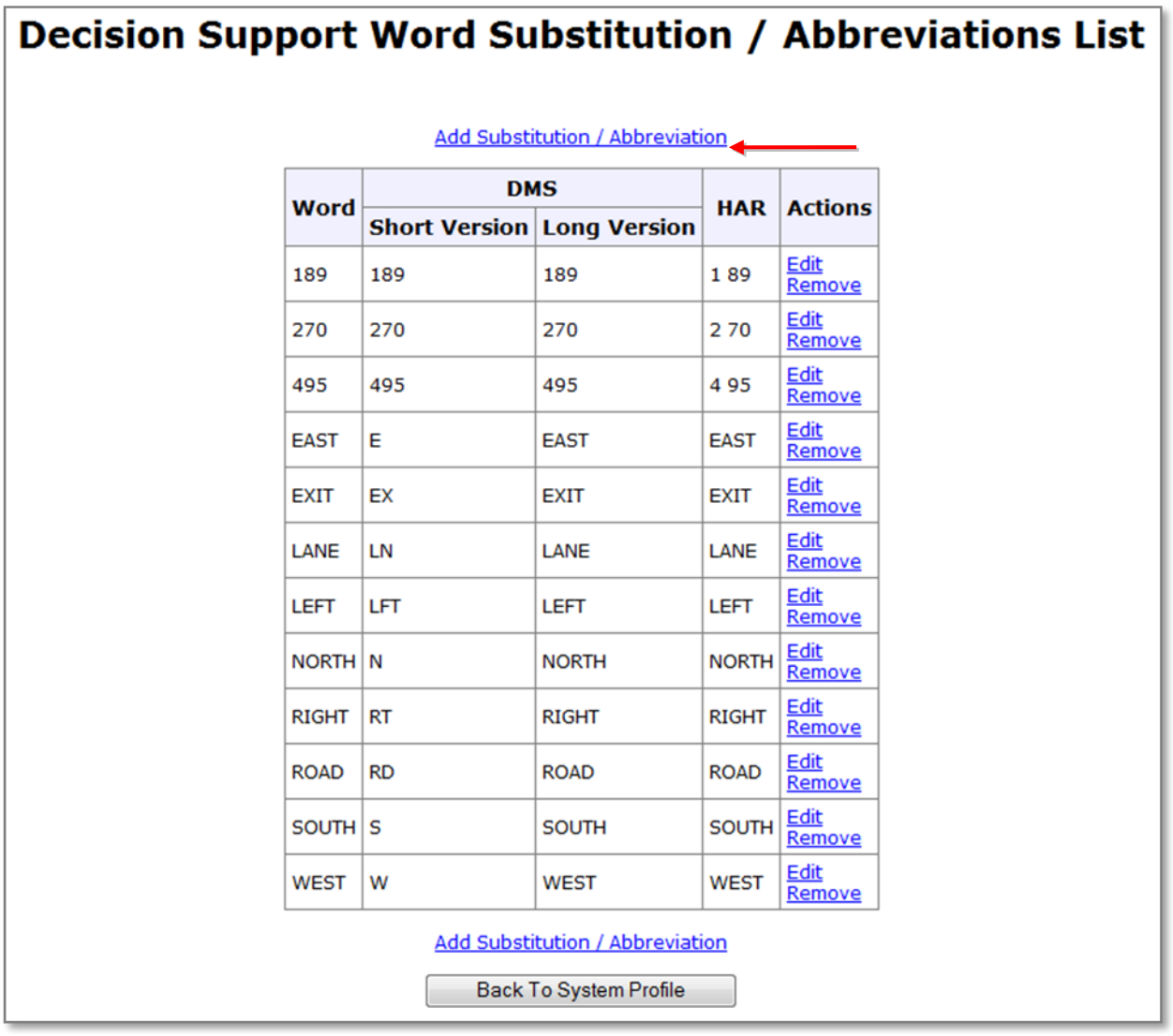


Figure 4-60. The Decision Support Word Substitution / Abbreviation List

A user may configure a new word substitution by clicking on the Add Substitution / Abbreviation link on the Word Substitution / Abbreviations list page. This will open the Add Word Substitution / Abbreviation page (see Figure 4-61 below). A user can enter a Word, a DMS Short Version, a DMS Long Version, and a HAR Version and save the substitution by clicking on the Add Substitution / Abbreviation button. A user can enter a blank for the DMS Short Version, DMS Long Version, or HAR Version substitution in order to remove the word from the message suggestion. It is valid for the user to enter blanks (not text) for the DMS short version, DMS long version or both. If both the DMS short and long versions are blank, the word or phrase will be removed from the DMS message completely. It is valid for the user to enter a blank (not text) for the HAR version. If the HAR version is blank, the word or phrase will be removed from the HAR message completely.

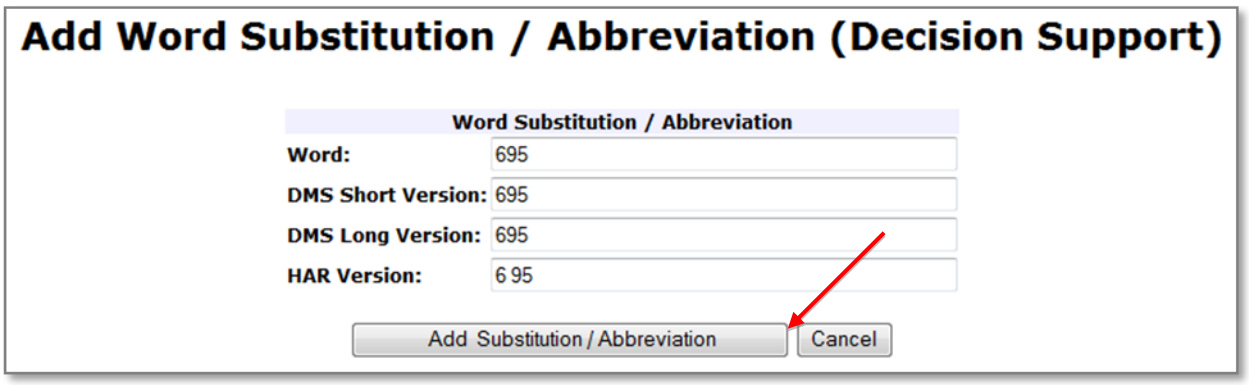


Figure 4-61. Adding a New Word Substitution / Abbreviation for Decision Support

4.4.3.9 Configuring Lane Closure Word Substitution/Abbreviation List

A user may configure lane closure word substitutions (or abbreviations) that are used when generating a suggested message from a device message template (see Figure 4-62 below). The substitutions are used to replace values from the traffic event's lane configuration status that are replacing the lane closure tag in the device message template. The substitutions are not used to replace text entered by the user. A user must configure a lane closure word substitution for each type of traffic event. A user can edit the DMS Short Version, the DMS Long Version, and the HAR Version and save the substitutions by clicking on the Save Changes button.

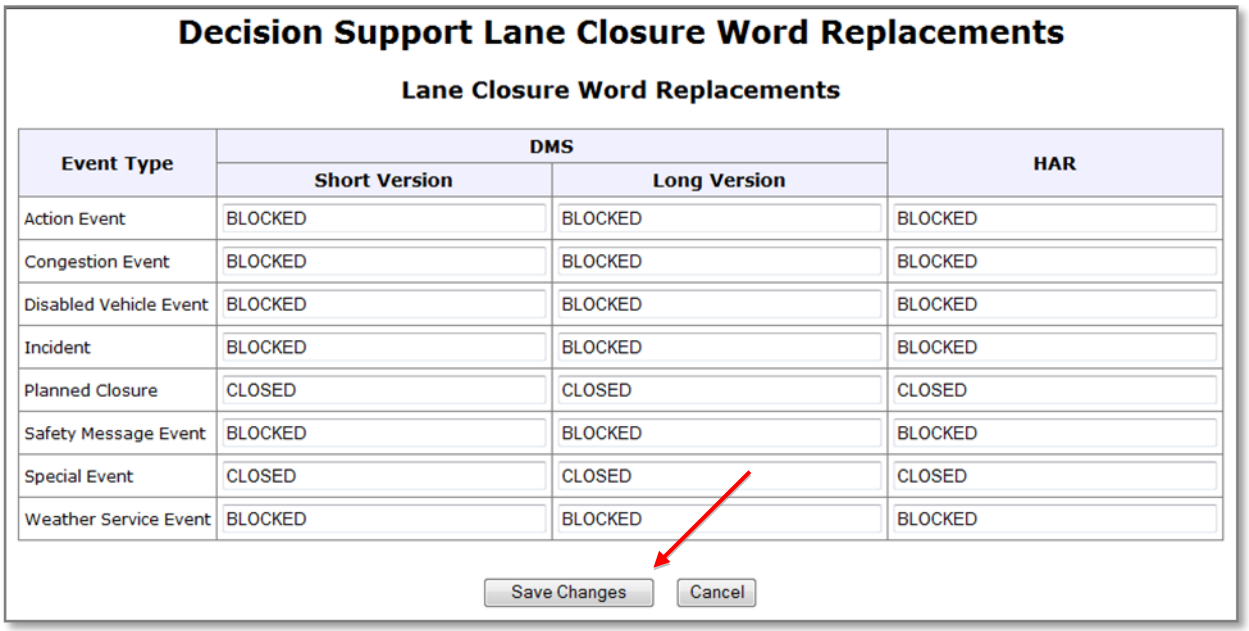


Figure 4-62. The Decision Support Lane Closure Word Replacements Page

4.4.3.10 Configure Event and Incident Type Tag Replacements

A user may configure traffic event type word replacements (see Figure 4-63 below) that are used when generating a suggested message from a message template. The replacements are used to

replace event type values from the traffic event that are replacing event type tags in the message template. For DMSs, the replacement is performed first using the long version for each word. If the suggested message will not fit on the DMS, the replacement is then performed using the short version for each word. For HARs, the replacement is only performed using the HAR version of the word. A user must configure a traffic event type replacement word for each type of traffic event. A user can configure a new replacement word on the Event and Incident Type Tag Replacements page by simply editing a replacement word and saving the form by clicking on the Save Changes button.

Traffic Event Type Tag Replacements

Event Type	DMS		HAR
	Short Version	Long Version	
Action Event	CRASH	CRASH	A CRASH
Congestion Event	CONGESTION	CONGESTION	CONGESTION
Disabled Vehicle Event	DISABLED VEHICLE	DISABLED VEHICLE	A DISABLED VEHICLE
Incident	CRASH	CRASH	A CRASH
Planned Closure	RDWK	ROADWORK	ROADWORK
Safety Message Event	SAFETY MESSAGE	SAFETY MESSAGE	A SAFETY MESSAGE
Special Event	SPECIAL EVENT	SPECIAL EVENT	A SPECIAL EVENT
Weather Service Event	INCLEMENT WEATHER	INCLEMENT WEATHER	INCLEMENT WEATHER

Figure 4-63. Configuring Replacement Text for the Traffic Event Type Tags.

A user may configure incident type (see Figure 4-64 below) word replacements that are used when generating a suggested message from a message template in the same manner as described for traffic event type word replacements above. The replacements are used to replace incident type values from the traffic event that are replacing incident type tags in the message template.

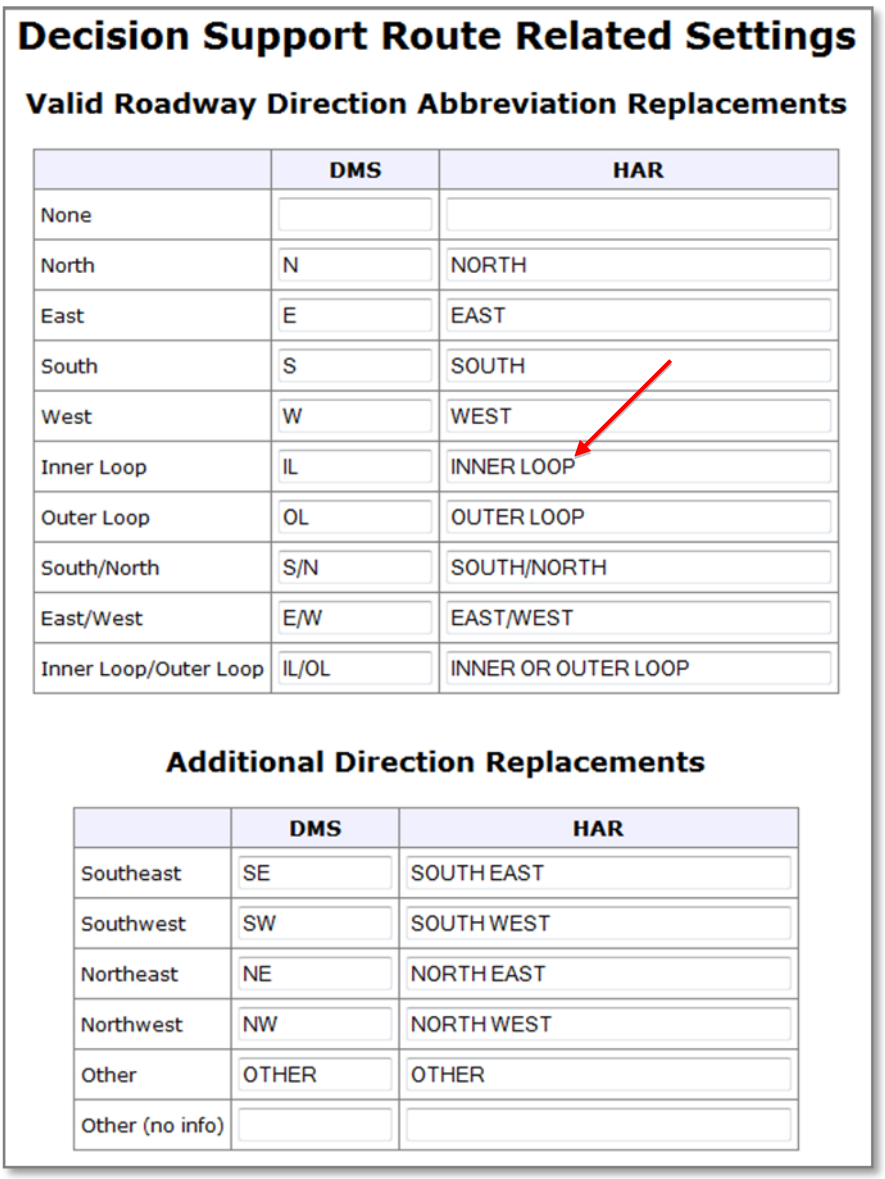
Incident Type Tag Replacements

Incident Type	DMS		HAR
	Short Version	Long Version	
Collision, Fatality	CRASH	CRASH	A FATAL CRASH
Collision, Personal Injury	CRASH	CRASH	A CRASH
Collision, Property Damage	CRASH	CRASH	A CRASH
Debris In Roadway	DEBRIS	DEBRIS	DEBRIS IN THE ROADWAY
Disabled In Roadway	DISABLED VEH	DISABLED VEHICLE	A DISABLED VEHICLE IN THE ROADWA
Emergency Roadwork	ROADWORK	EMERGENCY RDWK	EMERGENCY ROADWORK
Off Road Activity	CRASH	CRASH	OFF ROAD ACTIVITY
Other	CRASH	CRASH	A CRASH
Police Activity	CRASH	CRASH	POLICE ACTIVITY
Utility Problem	CRASH	CRASH	A UTILITY PROBLEM
Vehicle Fire	CRASH	CRASH	A VEHICLE FIRE
Weather Closure	CRASH	CRASH	BAD WEATHER
Weather Closure, Debris	CRASH	CRASH	BAD WEATHER WITH DEBRIS IN THE F
Weather Closure, Utility	ACC	ACCIDENT	BAD WEATHER WITH A UTILITY PROB
Weather Closure, High Water	CRASH	CRASH	BAD WEATHER WITH HIGH WATER
Weather Closure, Winter Precip.	CRASH	CRASH	BAD WEATHER WITH FREEZING PREC

Figure 4-64. Configuring Replacement Text for the Incident Type Tags

4.4.3.11 Configure Route Direction Replacements

A user may configure route direction and additional direction replacements that are used when generating a suggested message from a message template (see Figure 4-65 below). The replacements are used to replace directions from the traffic event that are replacing route direction tags in the message template. A user can configure a new replacement word on the Route Related Settings page by simply editing a replacement word and saving the form by clicking on the Save Changes button. A user can enter a blank replacement for a route direction to indicate that the route direction should not be used in message content.



Decision Support Route Related Settings

Valid Roadway Direction Abbreviation Replacements

	DMS	HAR
None		
North	N	NORTH
East	E	EAST
South	S	SOUTH
West	W	WEST
Inner Loop	IL	INNER LOOP
Outer Loop	OL	OUTER LOOP
South/North	S/N	SOUTH/NORTH
East/West	E/W	EAST/WEST
Inner Loop/Outer Loop	IL/OL	INNER OR OUTER LOOP

Additional Direction Replacements

	DMS	HAR
Southeast	SE	SOUTH EAST
Southwest	SW	SOUTH WEST
Northeast	NE	NORTH EAST
Northwest	NW	NORTH WEST
Other	OTHER	OTHER
Other (no info)		

Figure 4-65. Configuring Replacement Text for the Valid Roadway Directions and Additional Directions

A user may configure route type suffix values that are used when generating a suggested message from a DMS message template (see Figure 4-66 below). The suffix is used when a route type from the traffic event replaces a route type tag in the message template. The suffix is appended to the end of the replaced route type value. For example. a suffix of "-" will result in a route type and number of I-95 rather than I 95.

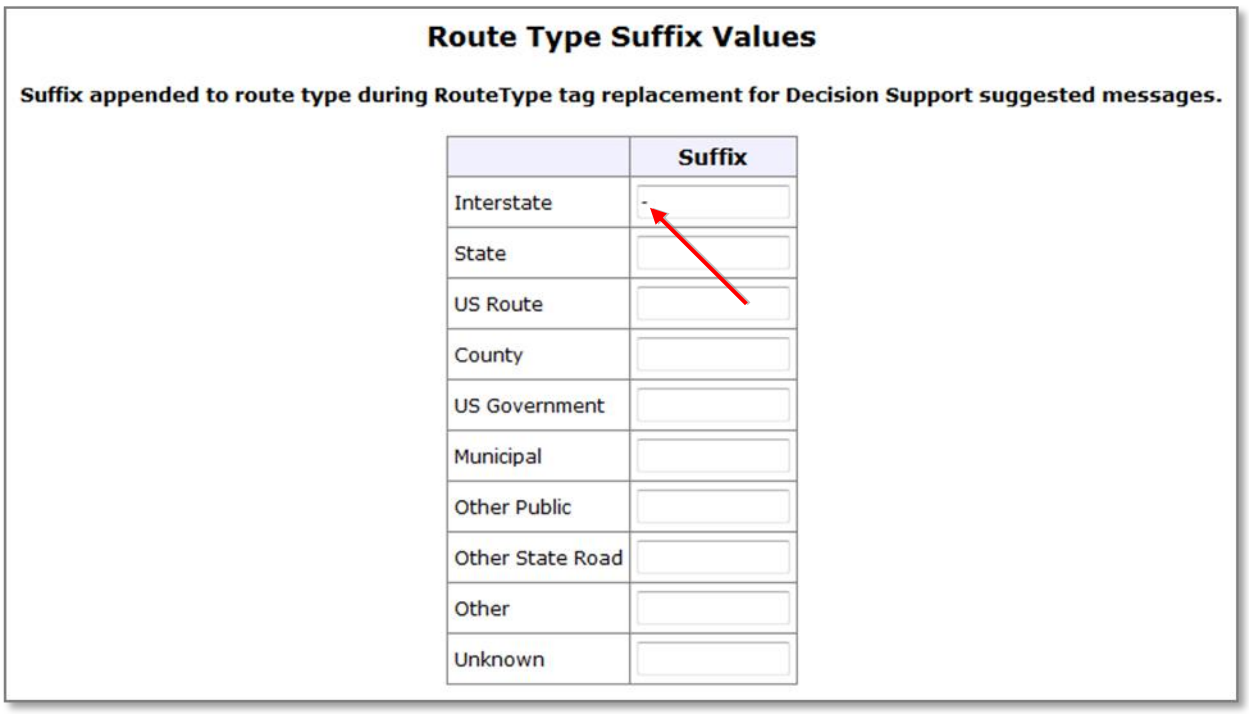


Figure 4-66. Configuring Route Type Suffix Values

4.5 H.264 Video

This section describes the user interface changes in R12 related to the H.264 Video feature.

CHART ATMS R12 adds a new H.264 codec to the suite of codecs supported by CHART. Starting with R12, CHART ATMS supports H.264-capable Impath encoders and decoders along with other codecs supported in R11, the CoreTec MPEG-4 encoder and decoder and the Impath MPEG-2 encoder and decoder. Additionally CHART ATMS still supports analog video via the V1500 Video Switch. A CHART monitor can be configured with any one of the supported "Video Receiving Devices": V1500 Switch, Impath MPEG-2, Core Tec MPEG-4, or, starting with R12, the Impath i5110-D decoder (supporting H.264 only) or an Impath VSG 5K-series decoder (supporting H.264 only). (The 5K-series includes the VSG 5820 and the VSG5000, which are understood to be functionally identical and therefore not distinguished within the ATMS.) A CHART video source can be configured with any number of "Video Sending Devices": V1500 Switch, Impath MPEG-2, Core Tec MPEG-4, or, starting with R12, the Impath i5110-E encoder (supporting H.264 only). As always, a CHART monitor can natively display any video source which has the matching Video Sending Device configured (as the only Video Sending Device or as one of multiple Video Sending Devices configured). If multiple Video Sending Devices are configured, CHART ATMS automatically uses the matching type of sending device. Note that Impath does not guarantee that their H.264 decoder will decode any H.264 except that encoded by their own H.264 encoders (this is expected industry-standard practice, as there is much variation allowed within the H.264 standard).

The sections below provide details on all of the changes.

4.5.1 New H.264 Fabric

A new H.264 video fabric will be added to support H.264 video. Note this is not new functionality. Existing functionality under Administration → Video → Video Fabrics will be used to create an IP video fabric to be called "SHA H.264 IP Fabric" or something similar, as shown in Figure 4-67.

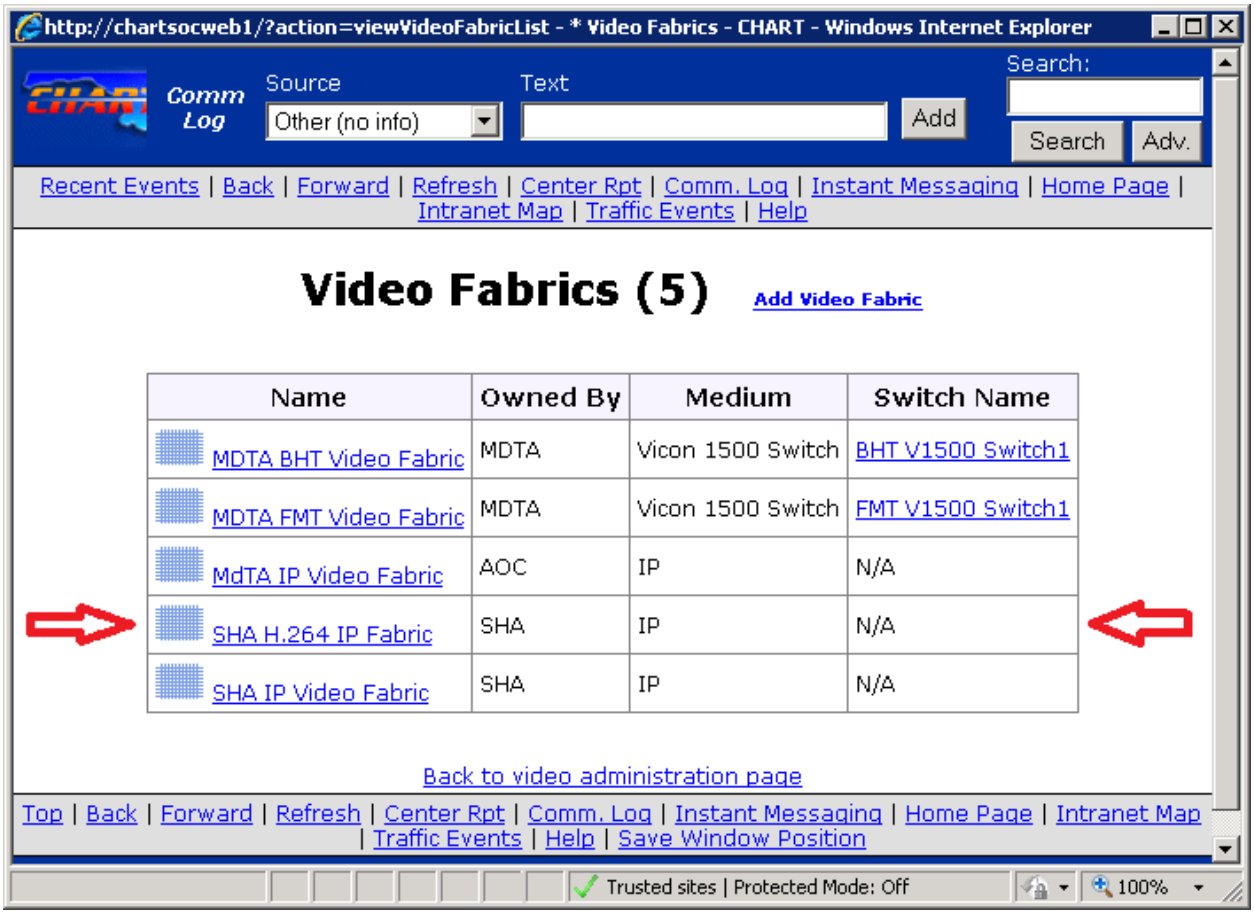


Figure 4-67. New H.264 Video Fabric

4.5.2 New H.264 Encoder and Decoder Types

Starting with CHART ATMS R12, CHART supports H.264 encoder and decoder types. Video sources using H.264 encoders and monitors using H.264 decoders will be configured to be on the new H.264 video fabric. As always, cameras can be configured with multiple sending devices, so, starting in R12, an Impath i5110-E encoder supporting H.264 can be the only sending device or one of a number of sending devices for a video source. As always, a monitor must be configured with exactly one receiving device, which starting in R12 can be one of the new Impath decoders which support H.264 (either the i5110-D or a VSG 5K-series decoder).

For example, a camera can be added, as shown in Figure 4-68, with the new SHA H.264 IP Fabric, specifying the new Impath i5110-E supporting H.264 encoder as the encoder type. The relevant part of the configuration of such a camera thus added might appear as in Figure 4-69.

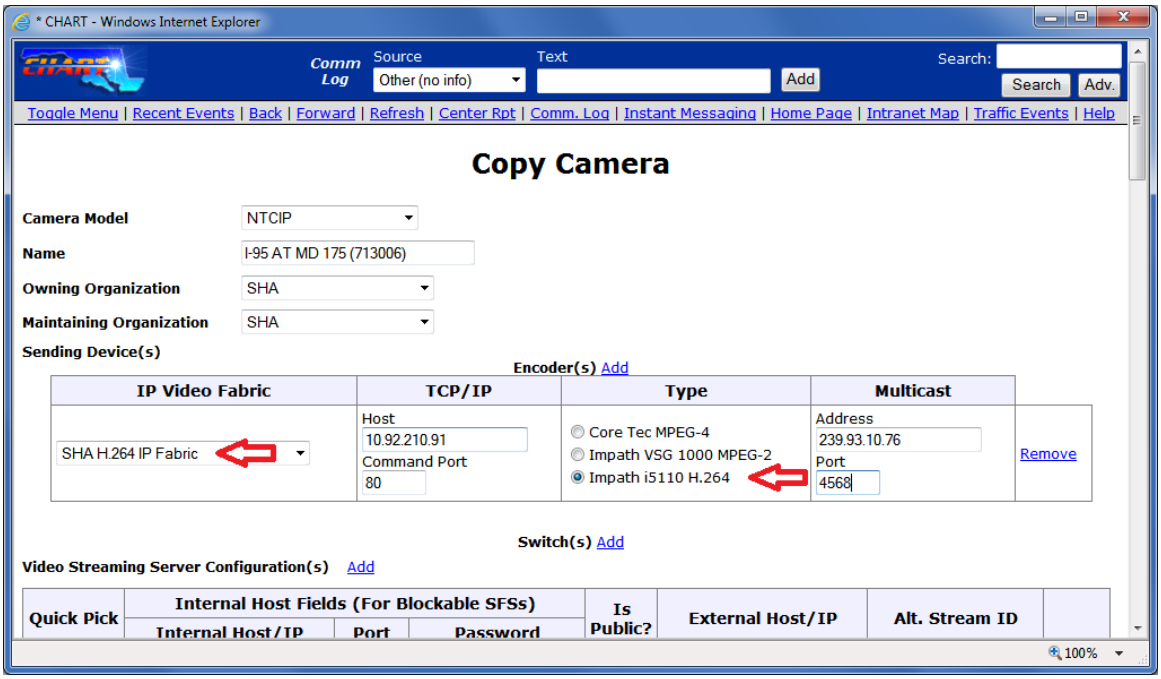


Figure 4-68. Adding a Camera with i5110 H.264 Encoder on H.264 Fabric

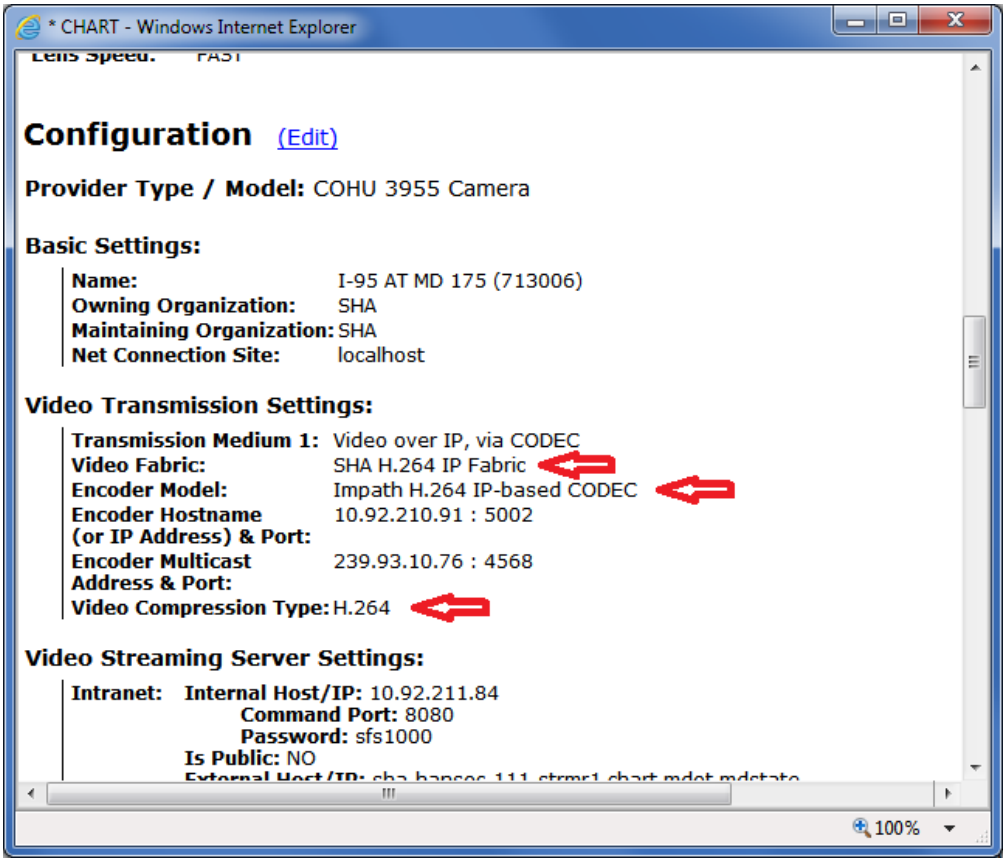


Figure 4-69. Configuration of Camera with H.264 Encoder on H.264 Fabric

The control codec would be configured such as shown in Figure 4-70, and would appear on the camera details page as in Figure 4-71.

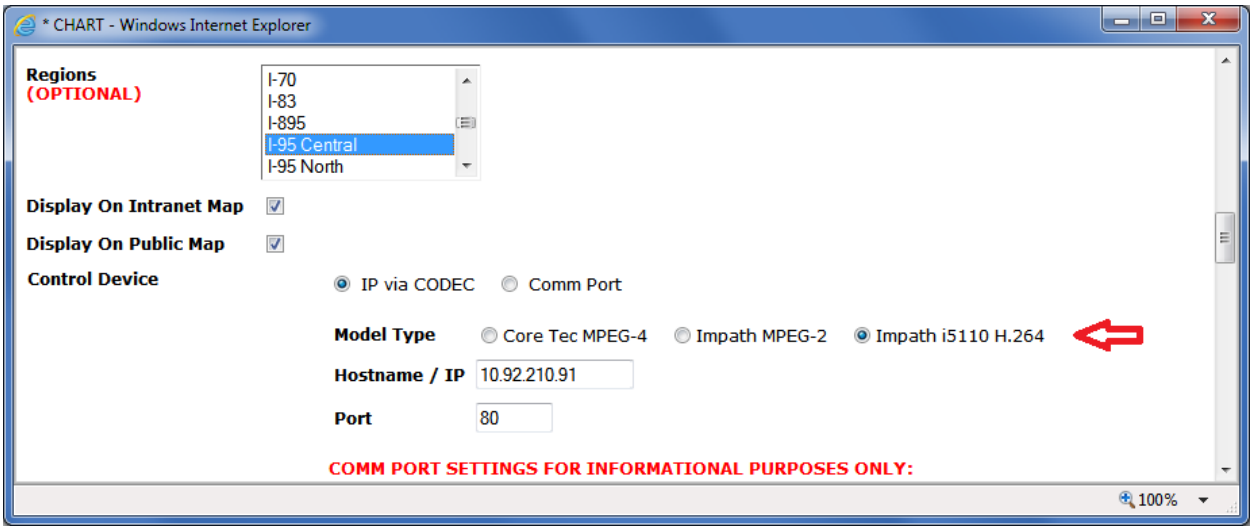


Figure 4-70. Adding a Camera with i5110 H.264 Control Device

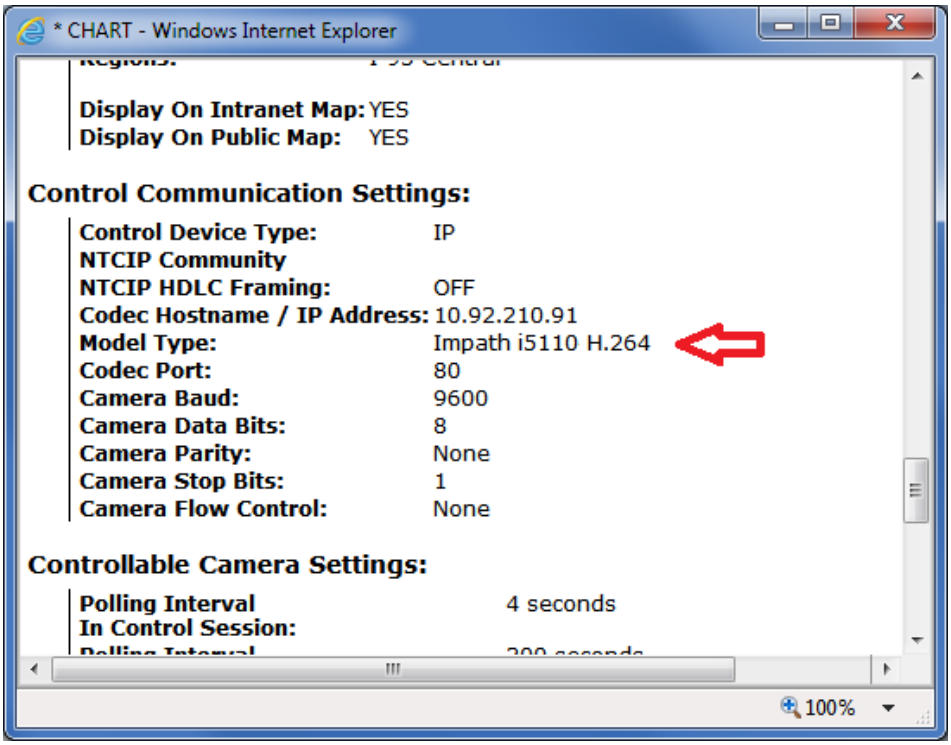


Figure 4-71. Configuration of Camera with i5110 H.264 Control Device

Likewise, a monitor can be added on the H.264 fabric, specifying one of the new H.264 decoder types, as shown in Figure 4-72. The relevant part of the configuration of a monitor thus added might appear as in Figure 4-73.

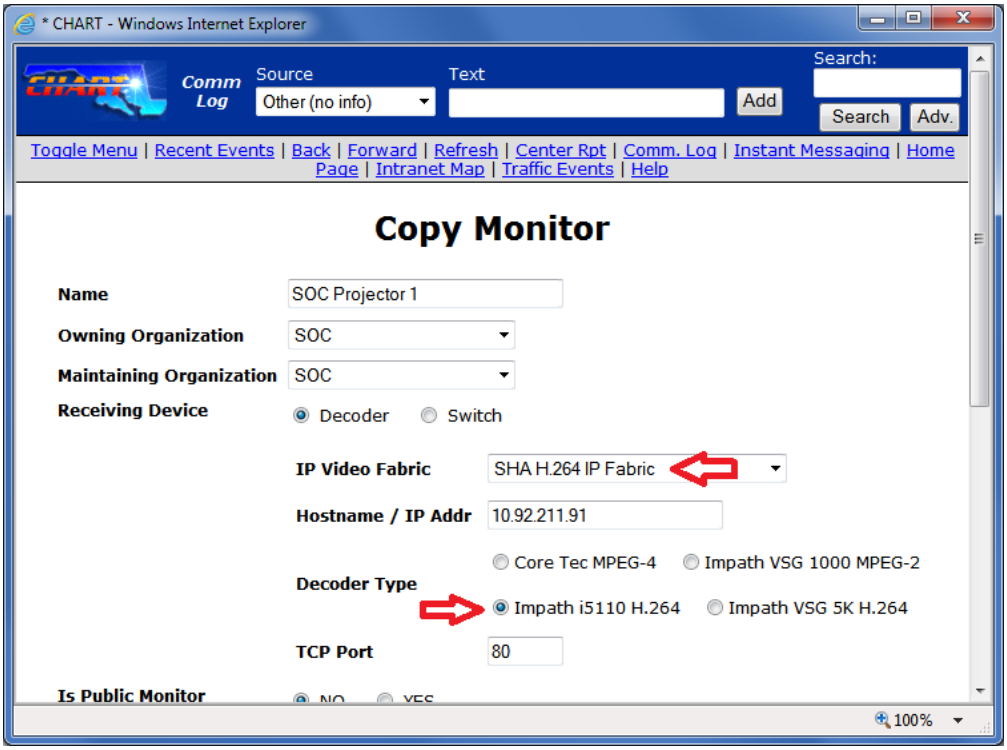


Figure 4-72. Adding a Monitor with i5110 H.264 Decoder on H.264 Fabric

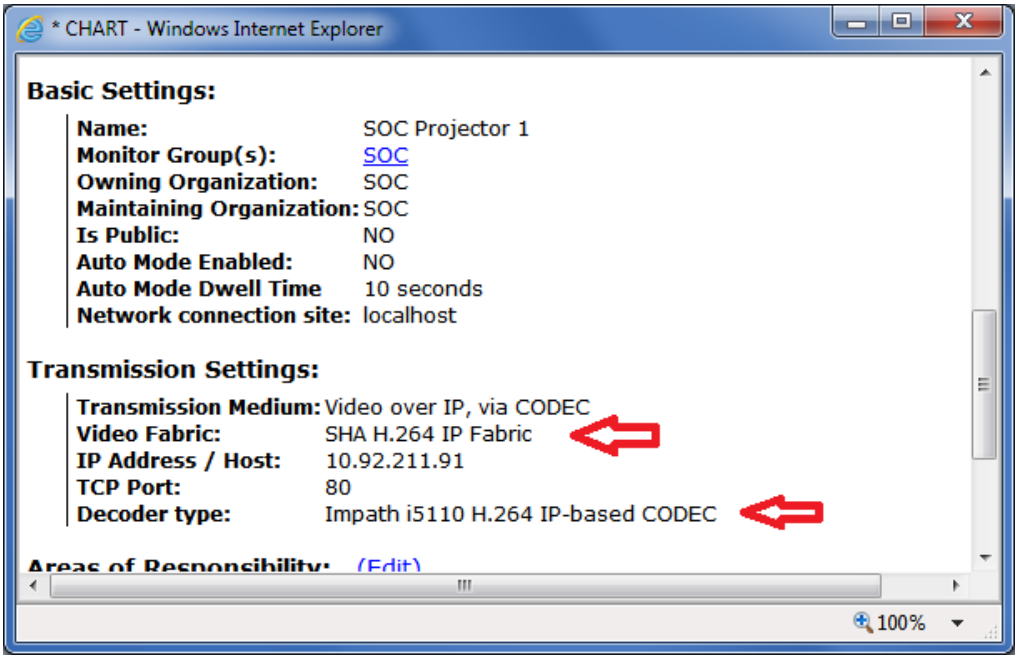


Figure 4-73. Configuration of Monitor with H.264 Decoder on H.264 Fabric

Once devices are added on the H.264 Fabric, any camera with an H.264 encoder can be displayed on any monitor with an H.264 decoder, using the same steps in the GUI as can be used to make monitor assignments using devices on other video fabrics. This process would not look any different from making other monitor assignments, as there is no need to identify encoder/decoder types and fabrics when displaying cameras on monitors. If a camera has multiple transmission devices (e.g., multiple encoders), the transmission device (e.g., encoder) appropriate to the monitor's receiving device is selected by the system automatically, without the user having be aware of these inner workings.

Likewise, as desired, bridge circuits having an H.264 encoder or decoder at one end can be configured into the system as well, the same as bridge circuits having Core Tec MPEG-4 encoders are configured. With such bridge circuits in place, SHA cameras having an H.264 encoder can be displayed on analog monitors connected to the FMT or BHT video switches (subject to availability of bridge circuits).

5 Deprecated Functionalities

The CHART ATMS R12 features do not deprecate any existing functionality.

6 Acronyms/Glossary

Table 6-1 defines acronyms and other terms used in this document.

Table 6.1. Acronyms and Glossary

Area of Responsibility	A geographic area that can be assigned to an operations center or monitor in order to define a boundary for information that the entity is responsible for/most interested in.
AOR	Area of Responsibility
Auto AVL Detection	A set of features that uses AVL data to detect when traffic event participants have arrived on the scene of the event, when event participants have departed the scene of the event, and to detect when a specific resource of a requested type has arrived on the scene of the event.
Auto Configured Event Resource	An event resource that has been added to the system automatically based on configuration data in an Event Resource Type and data obtained from the AVL system.
AVL	Automatic Vehicle Location
Decision Support	CHART sub-system that focuses on assisting operators in their use of the system and the resources that the system controls. In the context of this document, this sub-system aims to assist operators in selecting the best devices to utilize when responding to a traffic event.
DMS	Dynamic Message Sign. An electronic sign used to display information to the traveling public.
DMS Display Configuration	Configuration information that pertains to properties of the display characteristics of a DMS, such as its sign type, size, and font.
DMS Traveler Information Message	A travel time or toll rate message. These messages are different from other DMS messages in that they contain fields that change automatically based on data from travel routes.
DMS Traveler Information Message Holiday	A holiday date defined in the system that is used for traveler information messages that indicate they are only allowed to be displayed on holidays or non-holidays.
Dynamic Message Sign	An electronic sign used to provide messages to motorists.
Event Resource	A resource that can be used as a participant in a traffic event.
Event Resource Type	A type of event resource, which can also be used as a participant in a traffic event.
Floodgate	An MD511 term used to identify a message all callers receive when they reach a given level in the call tree. Floodgate messages can be managed manually (using the MD511 console) or automatically (after deployment of Release 12).
Functional right	A user right, granted to CHART users via Roles. Each operation on a device, including the ability to configure a device, view its sensitive information, and issue commands to the device are controlled by user rights. Users must possess the proper right to be able to perform these actions.
GIS	A Geographic Information System (GIS) is any system that captures, stores, analyzes, manages, and presents data that are linked to location
HAR	Highway Advisory Radio. A radio station used to broadcast programmable messages to motorists and other travelers regarding traffic and other delays.
Home Page Map	The map component shown on the home page of the CHART user interface.
Integrated Map	The mapping components that are part of the CHART user interface.
Intranet Map	The CHART Mapping application that is not integrated into the CHART user interface.

Location Alias	A pre-defined location (lat/lon) that has been stored with some name attributes to allow operators to utilize the location repeatedly.
Maintenance Portal	A customized version of the CHART GUI tailored to device maintenance personnel.
Nearby Devices Map	Map shown on the details page for a traffic event that shows only the target traffic event and the devices that are near it.
NTCIP	National Transportation Communications for ITS Protocol. A family of standards designed to achieve interoperability and interchangeability between computers and electronic traffic control equipment from different manufacturers.
Object Location Map	Map component that is used in conjunction with the object location form when setting the location of a traffic event or device.
Open Layers	Open source JavaScript mapping API utilized by the integrated map components in the CHART GUI.
Participant	In the context of a traffic event, an event resource or type that has been assigned to the traffic event.
Participation	In the context of a traffic event, a record of a participant's involvement with the traffic event that includes the notified, arrived/responded, and departed flags / timestamps, in addition to user-entered notes and other data.
Response Plan	A set of actions associated with a traffic event.
Response Plan Item	A single executable action within a traffic event response plan.
REST	Representational State Transfer - a web services architecture style used in CHART that leverages web technologies such as http and XML
RWIS	Roadway Weather Information System
Standard GUI	The CHART ATMS GUI when ***not*** accessed via the maintenance portal.
Travel Route	A series of one or more roadway links, usually forming a path from a DMS to some known destination.
TSS	Transportation Sensor System
TTS	Text-to-Speech – a method for converted the written word to the spoken word.
WMS	A Web Map Service (WMS) is a standard protocol for serving georeferenced map images over the Internet that are generated by a map server using data from a GIS database.

7 Mapping To Requirements

Table 7-1 shows how the requirements in the CHART R12 Requirements document map to design elements contained in this design.

Table 7-1. Mapping to Requirements

Tag	Requirement	Feature	Use Cases	Other Design Elements
Tag	Requirement	Feature	Use Cases	Other Design Elements
SR1	ADMINISTER SYSTEMS AND EQUIPMENT		N/A	N/A
SR1.4	MANAGE CHART CONTROL		N/A	N/A
SR1.4.2	PERFORM SHIFT HAND-OFF (INCOMING) AND VIEW OPERATIONS CENTER HOME PAGE		N/A	N/A
SR1.4.2.3	The system shall allow the user (once the initial login and shift hand off are complete), to view the Operations Center home page.		N/A	N/A
SR1.4.2.3.5	The home page shall contain an area used to view open events for the user's Center.		N/A	N/A
SR1.4.2.3.5.11	The Home Page shall indicate if an event is a Linked Event	Import	View Linked Event Info on Home Page	GUIServletTrafficEventClasses CD, GUIDataTrafficEventClasses CD
SR1.4.2.3.5.11.1	The Home Page shall indicate which columns contain values obtained from an External Event and therefore were not entered by an ATMS user.	Import	View Linked Event Info on Home Page	GUIServletTrafficEventClasses CD, GUIDataTrafficEventClasses CD
SR1.4.2.3.5.11.2	The Home Page Event List page shall indicate if any External Event Change Indicator is set for a Linked Event. (It does not have to indicate which ones are set.)	Import	View Linked Event Info on Home Page	GUIServletTrafficEventClasses CD, GUIDataTrafficEventClasses CD

Tag	Requirement	Feature	Use Cases	Other Design Elements
SR1.4.2.3.5.12	The Home Page shall contain External Events not yet associated with a Linked Event, have their Interesting flag set, and are located in the Operations Center's AOR.	Import	View Linked Event Info on Home Page	GUIServletTrafficEventClasses CD, GUIDataTrafficEventClasses CD
SR1.4.2.11	View Operations Center Report		N/A	N/A (Heading)
SR1.4.2.11.3	The operations center report shall list all open traffic events that are being controlled by the operations center or that are within the operations center's AOR.	Participants	View Op Center's Open Events	N/A (Existing Functionality)
SR1.4.2.11.3.6	The Operations Center Event List page shall contain Linked Events owned by the Operations Center	Import	View Linked Event Info on Op Center Report	GUIServletUsermgmtClasses CD, GUIDataTrafficEventClasses CD
SR1.4.2.11.3.6.1	The Operations Center report's event list shall indicate if an event is a Linked Event.	Import	View Linked Event Info on Op Center Report	GUIServletUsermgmtClasses CD, GUIDataTrafficEventClasses CD
SR1.4.2.11.3.6.2	The Operations Center Event List page shall indicate which columns contain values obtained from an External Event and therefore were not entered by a CHART user.	Import	View Linked Event Info on Op Center Report	GUIServletUsermgmtClasses CD, GUIDataTrafficEventClasses CD
SR1.4.2.11.3.6.3	The Operations Center report's event list shall indicate if any External Event Change Indicator is set for a Linked Event. (It does not have to indicate which ones are set.)	Import	View Linked Event Info on Op Center Report	GUIServletUsermgmtClasses CD, GUIDataTrafficEventClasses CD
SR1.4.2.11.3.7	The Operations Center Event List page shall contain open External Events which are not yet associated with a Linked Event, have their Interesting flag set, and are located within the Operations Center's AOR.	Import	View Linked Event Info on Op Center Report	GUIServletUsermgmtClasses CD, GUIDataTrafficEventClasses CD
SR1.5	INSTALL AND MAINTAIN DEVICES		N/A	N/A

Tag	Requirement	Feature	Use Cases	Other Design Elements
SR1.5.2	PUT EQUIPMENT/ DEVICES ON-LINE		N/A	N/A
SR1.5.2.1	The system shall allow the user with appropriate rights to select (or modify) the equipment device parameters.		N/A	N/A
SR1.5.2.1.18	The system shall support setting configuration parameters for Cameras.		N/A	N/A
SR1.5.2.1.18.2	Add / Copy Video Source	Video	Configure Video : Add Video Source, Specify Video Source Parameters	
SR1.5.2.1.18.2.1	The system shall allow a suitably privileged user to add a generic "video source" to the system.	Video	Configure Video : Add Video Source, Specify Video Source Parameters	
SR1.5.2.1.18.2.2	The system shall allow the user to specify the attributes listed under the Edit Basic Video Source Configuration requirements when adding a video source.	Video	Configure Video : Add Video Source, Specify Video Source Parameters	
SR1.5.2.1.18.2.4	The system shall allow the user to pre-populate the configuration settings for creating a new Video Source using the settings of an existing Video Source.	Video	Configure Video : Add Video Source, Specify Video Source Parameters	
SR1.5.2.1.18.3	Add / Copy Fixed Camera	Video	Configure Video : Add Fixed Camera, Specify Fixed Camera Parameters	
SR1.5.2.1.18.3.1	The system shall allow a suitably privileged user to add a fixed camera to the system.	Video	Configure Video : Add Fixed Camera, Specify Fixed Camera Parameters	

Tag	Requirement	Feature	Use Cases	Other Design Elements
SR1.5.2.1.18.3.2	The system shall allow the user to specify the attributes listed under the Edit Fixed Camera Configuration requirements when adding a fixed camera.	Video	Configure Video : Add Fixed Camera, Specify Fixed Camera Parameters	
SR1.5.2.1.18.3.4	The system shall allow the user to pre-populate the configuration settings for creating a new Fixed Camera using the settings of an existing Fixed Camera.	Video	Configure Video : Add Fixed Camera, Specify Fixed Camera Parameters	
SR1.5.2.1.18.4	Add / Copy COHU 3955 Camera	Video	Configure Video : Add Controllable Camera, Specify COHU Camera Parameters	
SR1.5.2.1.18.4.1	The system shall allow a suitably privileged user to add a COHU 3955 camera to the system.	Video	Configure Video : Add Controllable Camera, Specify COHU Camera Parameters	
SR1.5.2.1.18.4.2	The system shall allow the user to specify the attributes listed under the Edit COHU 3955 Camera Configuration requirements when adding a COHU 3955 camera.	Video	Configure Video : Add Controllable Camera, Specify COHU Camera Parameters	
SR1.5.2.1.18.4.4	The system shall allow the user to pre-populate the configuration settings for creating a new COHU 3955 camera using the settings of an existing COHU 3955 camera.	Video	Configure Video : Add Controllable Camera, Specify COHU Camera Parameters	
SR1.5.2.1.18.5	Add / Copy Vicon SVFT Camera	Video	Configure Video : Add Controllable Camera, Specify SVFT Camera Parameters	
SR1.5.2.1.18.5.1	The system shall allow a suitably privileged user to add a Vicon SVFT camera to the system.	Video	Configure Video : Add Controllable Camera, Specify SVFT Camera Parameters	

Tag	Requirement	Feature	Use Cases	Other Design Elements
SR1.5.2.1.18.5.2	The system shall allow the user to specify the attributes listed under the Edit Vicon SVFT Camera Configuration requirements when adding a Vicon SVFT camera.	Video	Configure Video : Add Controllable Camera, Specify SVFT Camera Parameters	
SR1.5.2.1.18.5.4	The system shall allow the user to pre-populate the configuration settings for creating a new Vicon SVFT camera using the settings of an existing Vicon SVFT camera.	Video	Configure Video : Add Controllable Camera, Specify SVFT Camera Parameters	
SR1.5.2.1.18.6	Edit Video Source Configuration	Video	Configure Video : Edit Video Source, Specify Video Source Parameters	
SR1.5.2.1.18.6.1	The system shall allow a suitably privileged user to edit the settings for an existing generic video source, as listed in SR1.5.2.1.18.8, Specify Video Source Attributes requirements.	Video	Configure Video : Edit Video Source, Specify Video Source Parameters	
SR1.5.2.1.18.7	Edit Camera Configuration	Decision Support	N/A	N/A
SR1.5.2.1.18.7.1	The system shall allow a suitably privileged user to edit the settings for an existing fixed camera, as listed in SR1.5.2.1.18.8, Specify Video Source Attributes and SR1.5.2.1.18.9, Specify Basic Camera Attributes requirements, except for the No Video Available flag.	Video	Configure Video : Edit Fixed Camera, Specify Fixed Camera Parameters, Specify Video Source Parameters	

Tag	Requirement	Feature	Use Cases	Other Design Elements
SR1.5.2.1.18.7.2	The system shall allow a suitably privileged user to edit the settings for an existing COHU 3955 camera, as listed in SR1.5.2.1.18.8, Specify Video Source Attributes, SR1.5.2.1.18.9, Specify Basic Camera Attributes, and SR1.5.2.1.18..10, Specify Controllable Camera Attributes requirements, except for the No Video Available flag.	Video	Configure Video : Edit COHU Camera, Specify COHU Camera Parameters, Specify Fixed Camera Parameters, Specify Video Source Parameters	
SR1.5.2.1.18.7.3	The system shall allow a suitably privileged user to edit the settings for an existing Vicon SVFT camera, as listed in SR1.5.2.1.18.8, Specify Video Source Attributes, SR1.5.2.1.18.9, Specify Basic Camera Attributes, and SR1.5.2.1.18..10, Specify Controllable Camera Attributes requirements, except for the No Video Available flag.	Video	Configure Video : Edit SVFT Camera, Specify SFVT Camera Parameters, Specify Fixed Camera Parameters, Specify Video Source Parameters	
SR1.5.2.1.18.7.4	The system shall allow a suitably privileged user to edit the settings for an existing NTCIP camera, as listed in SR1.5.2.1.18.8, Specify Video Source Attributes, SR1.5.2.1.18.9, Specify Basic Camera Attributes, and SR1.5.2.1.18.10, Specify Controllable Camera Attributes requirements, except for the No Video Available flag.	Video	Configure Video : Edit NTCIP Camera, Specify NTCIP Camera Parameters, Specify Fixed Camera Parameters, Specify Video Source Parameters	
SR1.5.2.1.18.7.6	The system shall allow a suitably privileged user to specify whether a camera is eligible for decision support.	Decision Support	Configure Devices: Configure Decision Support Eligible	Screenshot HMI: Figure 4-50 Screenshot HMI: Figure 4-51 CameraControlIDLClasses CD
SR1.5.2.1.18.8	Specify Video Source Attributes	Video	N/A	N/A

Tag	Requirement	Feature	Use Cases	Other Design Elements
SR1.5.2.1.18.8.5	The system shall allow the user to specify parameters for the encoder, if the video source is sending data via a CODEC.	Video	Configure Video : Specify Encoder Parameters	
SR1.5.2.1.18.8.6	The system shall allow the user to specify the hostname or IP address of the CODEC's host, if a CODEC is being used.	Video	Configure Video : Specify Encoder Parameters	
SR1.5.2.1.18.8.7	The system shall allow the user to specify the port used by the CODEC, if a CODEC is being used.	Video	Configure Video : Specify Encoder Parameters	
SR1.5.2.1.18.8.8	The system shall allow the user to specify the multicast address used by a CODEC video connection, if a CODEC is being used.	Video	Configure Video : Specify Encoder Parameters	
SR1.5.2.1.18.8.9	The system shall allow the user to specify the multicast port used by a CODEC video connection, if a CODEC is being used.	Video	Configure Video : Specify Encoder Parameters	
SR1.5.2.1.18.8.11	The system shall allow the user to specify zero or more video sending devices for use by a single video source.	Video	Configure Video : Specify Encoder Parameters	
SR1.5.2.1.18.8.11.3	The system shall require the user to specify the type of sending device for each configured sending device. [NEW BUT ALREADY IMPLEMENTED.]	Video	Configure Video : Specify Encoder Parameters	
SR1.5.2.1.18.8.11.3.4	The system shall allow a sending device type of Impath i5110-E encoder configured for H.264 encoding.	Video	Configure Video : Specify Encoder Parameters	

Tag	Requirement	Feature	Use Cases	Other Design Elements
SR1.5.2.1.18.12	Add / Copy NTCIP Camera	Video	Configure Video : Add NTCIP Camera, Specify NTCIP Camera Parameters, Specify Fixed Camera Parameters, Specify Video Source Parameters	
SR1.5.2.1.18.12.1	The system shall allow a suitably privileged user to add an NTCIP camera to the system.	Video	Configure Video : Add NTCIP Camera, Specify NTCIP Camera Parameters, Specify Fixed Camera Parameters, Specify Video Source Parameters	
SR1.5.2.1.18.12.2	The system shall allow the user to specify the attributes listed under the Edit NTCIP Camera Configuration requirements, SR1.5.2.1.18.7.4, when adding an NTCIP camera.	Video	Configure Video : Add NTCIP Camera, Specify NTCIP Camera Parameters, Specify Fixed Camera Parameters, Specify Video Source Parameters	
SR1.5.2.1.18.12.3	The system shall require the user to choose a factory site when adding an NTCIP camera.	Video	Configure Video : Add NTCIP Camera, Specify NTCIP Camera Parameters, Specify Fixed Camera Parameters, Specify Video Source Parameters	

Tag	Requirement	Feature	Use Cases	Other Design Elements
SR1.5.2.1.18.12.4	The system shall allow the user to pre-populate the configuration settings for creating a new NTCIP camera using the settings of an existing NTCIP camera.	Video	Configure Video : Add NTCIP Camera, Specify NTCIP Camera Parameters, Specify Fixed Camera Parameters, Specify Video Source Parameters	
SR1.5.2.1.19	The system shall support setting configuration parameters for Monitors.	Video	N/A	N/A
SR1.5.2.1.19.1	Specify Monitor Configuration	Video	N/A	N/A
SR1.5.2.1.19.1.5	The system shall allow the user to specify parameters for the decoder, if the monitor is receiving data via a CODEC.	Video	Configure Video : Specify Decoder Parameters	
SR1.5.2.1.19.1.6	The system shall allow the user to specify the hostname or IP address of the CODEC's host, if a CODEC is being used.	Video	Configure Video : Specify Decoder Parameters	
SR1.5.2.1.19.1.7	The system shall allow the user to specify the port used by the CODEC, if a CODEC is being used.	Video	Configure Video : Specify Decoder Parameters	
SR1.5.2.1.19.1.14	The system shall require the user to specify exactly one receiving device for a monitor. [NEW BUT ALREADY IMPLEMENTED]	Video	Configure Video : Specify Decoder Parameters	
SR1.5.2.1.19.1.14.5	The system shall allow the user to specify that the receiving device is an Impath i5110-D decoder supporting H.264 decoding. (The i5110-D is a small single-port decoder.)	Video	Configure Video : Specify Decoder Parameters	

Tag	Requirement	Feature	Use Cases	Other Design Elements
SR1.5.2.1.19.1.14.6	The system shall allow the user to specify that the receiving device is an Impath VSG 5K-series decoder supporting H.264 decoding. (The decoders known to be part of the supported Impath VSG 5K-series are the Impath VSG 5280-D (8-port unit for TOCs) and the Impath VSG 5000-D (chassis based for SOC - up to 104 ports). Each decoder in these multi-port units has its own IP address and is functionally a standalone single-port unit, sharing a single housing.)	Video	Configure Video : Specify Decoder Parameters	
SR1.5.2.1.19.2	Add / Copy Monitor	Video	Configure Video : Add Monitor, Configure Monitor	
SR1.5.2.1.19.2.1	The system shall allow a suitably privileged user to add a monitor to the system.	Video	Configure Video : Add Monitor, Configure Monitor	
SR1.5.2.1.19.2.2	The system shall allow the user to specify the configuration parameters of the new monitor, as defined by the Specify Monitor Configuration requirements.	Video	Configure Video : Add Monitor, Configure Monitor	
SR1.5.2.1.19.2.4	The system shall allow the user to pre-populate the configuration settings for creating a new Monitor using the settings of an existing Monitor.	Video	Configure Video : Add Monitor, Configure Monitor	
SR1.5.2.1.19.3	Edit Monitor Configuration	Video	Configure Video : Edit Monitor, Configure Monitor	
SR1.5.2.1.19.3.1	The system shall allow a suitably privileged user to edit the configuration of an existing monitor.	Video	Configure Video : Edit Monitor, Configure Monitor	

Tag	Requirement	Feature	Use Cases	Other Design Elements
SR1.5.2.1.19.3.2	The system shall allow the user to specify the configuration parameters for the existing Monitor, as defined by the Specify Monitor Configuration requirements.	Video	Configure Video : Edit Monitor, Configure Monitor	
SR3	MONITOR TRAFFIC AND ROADWAYS		N/A	N/A
SR3.6	UTILIZE VIDEO	Video	N/A	N/A
SR3.6.1	The system shall allow a suitably privileged user to control cameras.	Video	N/A	N/A
SR3.6.1.4	A suitably privileged CHART II operator shall have the capability to initiate camera control.	Video	N/A	N/A
SR3.6.1.4.3	A suitably privileged operator shall be able to pan or tilt a camera for which a control session is open.	Video	Manage Video : Control Camera	This is marked as implemented to force retesting with the new H.264 codecs, but there is no actual change in implementation for this requirement.
SR3.6.1.4.3.1	Pan and tilt shall include controls for moving the camera vertically and horizontally.	Video	Manage Video : Control Camera	This is marked as implemented to force retesting with the new H.264 codecs, but there is no actual change in implementation for this requirement.
SR3.6.1.4.3.4	The system shall allow a suitably privileged user to pan or tilt a Vicon SVFT camera for which a control session is open.	Video	Manage Video : Control SVFT Camera	This is marked as implemented to force retesting with the new H.264 codecs, but there is no actual change in implementation for this requirement.
SR3.6.1.4.3.5	The system shall allow a suitably privileged user to pan or tilt a COHU camera for which a control session is open.	Video	Manage Video : Control COHU Camera	This is marked as implemented to force retesting with the new H.264 codecs, but there is no actual change in implementation for this requirement.
SR3.6.1.4.3.6	The system shall allow a suitably privileged user to pan or tilt an NTCIP camera for which a control session is open.	Video	Manage Video : Control NTCIP Camera	This is marked as implemented to force retesting with the new H.264 codecs, but there is no actual change in implementation for this requirement.
SR3.6.1.4.4	A suitably privileged operator shall be able to zoom a camera for which a control session is open.	Video	Manage Video : Control Camera	This is marked as implemented to force retesting with the new H.264 codecs, but there is no actual change in implementation for this requirement.
SR3.6.1.4.4.1	The system shall allow a suitably privileged user to zoom a Vicon SVFT camera for which a control session is open.	Video	Manage Video : Control SVFT Camera	This is marked as implemented to force retesting with the new H.264 codecs, but there is no actual change in implementation for this requirement.

Tag	Requirement	Feature	Use Cases	Other Design Elements
SR3.6.1.4.4.2	The system shall allow a suitably privileged user to zoom a COHU camera for which a control session is open.	Video	Manage Video : Control COHU Camera	This is marked as implemented to force retesting with the new H.264 codecs, but there is no actual change in implementation for this requirement.
SR3.6.1.4.4.3	The system shall allow a suitably privileged user to zoom an NTCIP camera for which a control session is open.	Video	Manage Video : Control NTCIP Camera	This is marked as implemented to force retesting with the new H.264 codecs, but there is no actual change in implementation for this requirement.
SR3.6.1.4.5	A suitably privileged operator shall be able to focus a camera for which a control session is open.	Video	Manage Video : Control Camera	This is marked as implemented to force retesting with the new H.264 codecs, but there is no actual change in implementation for this requirement.
SR3.6.1.4.5.1	The system shall not allow the user to adjust the focus if the camera is in auto focus mode.	Video	Manage Video : Control Camera	This is marked as implemented to force retesting with the new H.264 codecs, but there is no actual change in implementation for this requirement.
SR3.6.1.4.5.2	The system shall allow a suitably privileged user to toggle the auto focus mode of a camera for which a control session is open, if the feature is supported by the camera model.	Video	Manage Video : Control Camera	This is marked as implemented to force retesting with the new H.264 codecs, but there is no actual change in implementation for this requirement.
SR3.6.1.4.5.3	The system shall allow a suitably privileged user to adjust the focus of a Vicon SVFT camera for which a control session is open.	Video	Manage Video : Control SVFT Camera	This is marked as implemented to force retesting with the new H.264 codecs, but there is no actual change in implementation for this requirement.
SR3.6.1.4.5.4	The system shall display the current focus mode (automatic or manual) when it is known, including after a focus or zoom command is performed.	Video	Manage Video : Control Camera	This is marked as implemented to force retesting with the new H.264 codecs, but there is no actual change in implementation for this requirement.
SR3.6.1.4.5.5	The system shall allow a suitably privileged user to adjust the focus of a COHU camera for which a control session is open.	Video	Manage Video : Control COHU Camera	This is marked as implemented to force retesting with the new H.264 codecs, but there is no actual change in implementation for this requirement.
SR3.6.1.4.5.6	The system shall allow a suitably privileged user to adjust the focus of an NTCIP camera for which a control session is open.	Video	Manage Video : Control NTCIP Camera	This is marked as implemented to force retesting with the new H.264 codecs, but there is no actual change in implementation for this requirement.

Tag	Requirement	Feature	Use Cases	Other Design Elements
SR3.6.1.4.6	A suitably privileged operator shall be able to adjust iris control of a camera for which a control session is open.	Video	Manage Video : Control Camera	This is marked as implemented to force retesting with the new H.264 codecs, but there is no actual change in implementation for this requirement.
SR3.6.1.4.6.1	The system shall not allow the user to adjust the iris if the camera is in auto iris mode.	Video	Manage Video : Control Camera	This is marked as implemented to force retesting with the new H.264 codecs, but there is no actual change in implementation for this requirement.
SR3.6.1.4.6.2	The system shall allow a suitably privileged user to toggle the auto iris mode of a camera for which a control session is open, if the feature is supported by the camera model.	Video	Manage Video : Control Camera	This is marked as implemented to force retesting with the new H.264 codecs, but there is no actual change in implementation for this requirement.
SR3.6.1.4.6.3	The system shall allow a suitably privileged user to toggle the auto iris mode of a Vicon SVFT camera for which a control session is open.	Video	Manage Video : Control SVFT Camera	This is marked as implemented to force retesting with the new H.264 codecs, but there is no actual change in implementation for this requirement.
SR3.6.1.4.6.4	The system shall allow a suitably privileged user to adjust the iris of a Vicon SVFT camera for which a control session is open.	Video	Manage Video : Control SVFT Camera	This is marked as implemented to force retesting with the new H.264 codecs, but there is no actual change in implementation for this requirement.
SR3.6.1.4.6.5	The system shall allow a suitably privileged user to toggle the auto iris mode of a COHU camera for which a control session is open.	Video	Manage Video : Control COHU Camera	This is marked as implemented to force retesting with the new H.264 codecs, but there is no actual change in implementation for this requirement.
SR3.6.1.4.6.6	The system shall allow a suitably privileged user to adjust the iris of a COHU camera for which a control session is open.	Video	Manage Video : Control COHU Camera	This is marked as implemented to force retesting with the new H.264 codecs, but there is no actual change in implementation for this requirement.
SR3.6.1.4.6.7	The system shall allow a suitably privileged user to toggle the auto iris mode of an NTCIP camera for which a control session is open.	Video	Manage Video : Control NTCIP Camera	This is marked as implemented to force retesting with the new H.264 codecs, but there is no actual change in implementation for this requirement.
SR3.6.1.4.6.8	The system shall allow a suitably privileged user to adjust the iris of an NTCIP camera for which a control session is open.	Video	Manage Video : Control NTCIP Camera	This is marked as implemented to force retesting with the new H.264 codecs, but there is no actual change in implementation for this requirement.

Tag	Requirement	Feature	Use Cases	Other Design Elements
SR3.6.1.4.7	A suitably privileged operator shall be able to adjust the color balance of a camera for which a control session is open.	Video	Manage Video : Control Camera	This is marked as implemented to force retesting with the new H.264 codecs, but there is no actual change in implementation for this requirement.
SR3.6.1.4.7.1	The system shall not allow the user to adjust the color balance if the camera is in auto color balance mode.	Video	Manage Video : Control Camera	This is marked as implemented to force retesting with the new H.264 codecs, but there is no actual change in implementation for this requirement.
SR3.6.1.4.7.2	The system shall allow a suitably privileged user to toggle the auto color balance mode of a camera for which a control session is open, if the feature is supported by the camera model.	Video	Manage Video : Control Camera	This is marked as implemented to force retesting with the new H.264 codecs, but there is no actual change in implementation for this requirement.
SR3.6.1.4.7.3	The system shall allow a suitably privileged user to adjust the color balance of a Vicon SVFT camera for which a control session is open.	Video	Manage Video : Control SVFT Camera	This is marked as implemented to force retesting with the new H.264 codecs, but there is no actual change in implementation for this requirement.
SR3.6.1.4.7.4	The system shall allow a suitably privileged user to change the color balance mode of a Vicon SVFT camera for which a control session is open.	Video	Manage Video : Control SVFT Camera	This is marked as implemented to force retesting with the new H.264 codecs, but there is no actual change in implementation for this requirement.
SR3.6.1.4.8	A suitably privileged operator shall be able to move a camera to a predefined preset position for which a control session is open	Video	Manage Video : Control Camera	This is marked as implemented to force retesting with the new H.264 codecs, but there is no actual change in implementation for this requirement.
SR3.6.1.4.9	The system shall allow a suitably privileged operator to maintain CCTV (camera) presets.	Video	Manage Video : Control Camera	This is marked as implemented to force retesting with the new H.264 codecs, but there is no actual change in implementation for this requirement.
SR3.6.1.4.9.4	A stored preset shall include an operator-specified title to appear on the camera image display for those camera types which support that functionality.	Video	Manage Video : Control Camera	This is marked as implemented to force retesting with the new H.264 codecs, but there is no actual change in implementation for this requirement.
SR3.6.1.4.9.4.1	The preset title shall appear on the display for those camera types which support such an action.	Video	Manage Video : Control Camera	This is marked as implemented to force retesting with the new H.264 codecs, but there is no actual change in implementation for this requirement.

Tag	Requirement	Feature	Use Cases	Other Design Elements
SR3.6.1.4.9.6	Save Camera Preset	Video	Manage Video : Control Camera	This is marked as implemented to force retesting with the new H.264 codecs, but there is no actual change in implementation for this requirement.
SR3.6.1.4.9.6.2	The system shall allow the user to specify which preset number to use when saving a preset.	Video	Manage Video : Control Camera	This is marked as implemented to force retesting with the new H.264 codecs, but there is no actual change in implementation for this requirement.
SR3.6.1.4.9.6.3	The system shall allow the user to enter a title when saving a preset.	Video	Manage Video : Control Camera	This is marked as implemented to force retesting with the new H.264 codecs, but there is no actual change in implementation for this requirement.
SR3.6.1.4.9.8	Delete Camera Preset	Video	Manage Video : Control Camera	This is marked as implemented to force retesting with the new H.264 codecs, but there is no actual change in implementation for this requirement.
SR3.6.1.4.9.8.1	The system shall allow a suitably privileged user to delete a previously saved camera preset.	Video	Manage Video : Control Camera	This is marked as implemented to force retesting with the new H.264 codecs, but there is no actual change in implementation for this requirement.
SR3.6.1.4.10	A suitably privileged operator shall be able to reset a camera for which a control session is open.	Video	Manage Video : Control Camera	This is marked as implemented to force retesting with the new H.264 codecs, but there is no actual change in implementation for this requirement.
SR3.6.1.4.10.1	The system shall allow a suitably privileged user to reset a Vicon SVFT camera for which a control session is open.	Video	Manage Video : Control SVFT Camera	This is marked as implemented to force retesting with the new H.264 codecs, but there is no actual change in implementation for this requirement.
SR3.6.1.4.10.2	The system shall allow a suitably privileged user to reset a COHU camera for which a control session is open.	Video	Manage Video : Control COHU Camera	This is marked as implemented to force retesting with the new H.264 codecs, but there is no actual change in implementation for this requirement.
SR3.6.1.4.11	A suitably privileged operator shall be able to power a camera on and off for those cameras which support that function.	Video	Manage Video : Control Camera	This is marked as implemented to force retesting with the new H.264 codecs, but there is no actual change in implementation for this requirement.
SR3.6.1.4.12	A suitably privileged operator shall be able to enter programming mode on a camera which supports a programming mode, provided a control session is open for that camera.	Video	Manage Video : Control SVFT Camera	This is marked as implemented to force retesting with the new H.264 codecs, but there is no actual change in implementation for this requirement.

Tag	Requirement	Feature	Use Cases	Other Design Elements
SR3.6.1.4.12.3	The system shall allow a suitably privileged user to enter Program Mode to enter menu commands for a Vicon SVFT camera for which a control session is open.	Video	Manage Video : Control SVFT Camera	This is marked as implemented to force retesting with the new H.264 codecs, but there is no actual change in implementation for this requirement.
SR3.6.1.4.12.3.1	The system shall allow the user to invoke the UP command while in Program Mode.	Video	Manage Video : Control SVFT Camera	This is marked as implemented to force retesting with the new H.264 codecs, but there is no actual change in implementation for this requirement.
SR3.6.1.4.12.3.2	The system shall allow the user to invoke the DOWN command while in Program Mode.	Video	Manage Video : Control SVFT Camera	This is marked as implemented to force retesting with the new H.264 codecs, but there is no actual change in implementation for this requirement.
SR3.6.1.4.12.3.3	The system shall allow the user to invoke the LEFT command while in Program Mode.	Video	Manage Video : Control SVFT Camera	This is marked as implemented to force retesting with the new H.264 codecs, but there is no actual change in implementation for this requirement.
SR3.6.1.4.12.3.4	The system shall allow the user to invoke the RIGHT command while in Program Mode.	Video	Manage Video : Control SVFT Camera	This is marked as implemented to force retesting with the new H.264 codecs, but there is no actual change in implementation for this requirement.
SR3.6.1.4.12.3.5	The system shall allow the user to invoke the AUX1 command while in Program Mode.	Video	Manage Video : Control SVFT Camera	This is marked as implemented to force retesting with the new H.264 codecs, but there is no actual change in implementation for this requirement.
SR3.6.1.4.12.3.6	The system shall allow the user to invoke the AUX2 command while in Program Mode.	Video	Manage Video : Control SVFT Camera	This is marked as implemented to force retesting with the new H.264 codecs, but there is no actual change in implementation for this requirement.
SR3.6.1.4.12.3.7	The system shall allow the user to invoke the AI / Back Out command while in Program Mode.	Video	Manage Video : Control SVFT Camera	This is marked as implemented to force retesting with the new H.264 codecs, but there is no actual change in implementation for this requirement.
SR3.6.1.4.12.3.8	The system shall allow the user to invoke the AP / Select command while in Program Mode.	Video	Manage Video : Control SVFT Camera	This is marked as implemented to force retesting with the new H.264 codecs, but there is no actual change in implementation for this requirement.
SR3.6.1.4.13	A suitably privileged operator shall be able to directly control the titles which appear on the camera image, for cameras which support direct setting of line 1 and 2 of the camera titles, provided a control session is open for that camera.	Video	Manage Video : Control Camera	This is marked as implemented to force retesting with the new H.264 codecs, but there is no actual change in implementation for this requirement.

Tag	Requirement	Feature	Use Cases	Other Design Elements
SR3.6.1.4.13.1	The system shall allow a suitably privileged user to directly control one of the title lines that appears on the Vicon SVFT camera image, provided that a control session is open for the camera.	Video	Manage Video : Control SVFT Camera	This is marked as implemented to force retesting with the new H.264 codecs, but there is no actual change in implementation for this requirement.
SR3.6.1.4.13.2	The system shall allow a suitably privileged user to view (within the user interface) the two title lines that are displayed on the Vicon SVFT camera.	Video	Manage Video : Control SVFT Camera	This is marked as implemented to force retesting with the new H.264 codecs, but there is no actual change in implementation for this requirement.
SR3.6.1.4.13.3	The system shall allow a suitably privileged user to directly control the line one title line that appears on the COHU camera image, provided that a control session is open for the camera.	Video	Manage Video : Control COHU Camera	This is marked as implemented to force retesting with the new H.264 codecs, but there is no actual change in implementation for this requirement.
SR3.6.1.4.13.4	The system shall allow a suitably privileged user to directly control the line two title line that appears on the COHU camera image, provided that a control session is open for the camera.	Video	Manage Video : Control COHU Camera	This is marked as implemented to force retesting with the new H.264 codecs, but there is no actual change in implementation for this requirement.
SR3.6.1.4.13.5	The system shall allow a suitably privileged user to directly control the line one title line that appears on the NTCIP camera image, provided that a control session is open for the camera.	Video	Manage Video : Control NTCIP Camera	This is marked as implemented to force retesting with the new H.264 codecs, but there is no actual change in implementation for this requirement.
SR3.6.1.4.13.6	The system shall allow a suitably privileged user to directly control the line two title line that appears on the NTCIP camera image, provided that a control session is open for the camera.	Video	Manage Video : Control NTCIP Camera	This is marked as implemented to force retesting with the new H.264 codecs, but there is no actual change in implementation for this requirement.
SR3.6.1.5	Cameras shall be polled at a configurable interval to verify control status.	Video	Manage Video : Control NTCIP Camera	This is marked as implemented to force retesting with the new H.264 codecs, but there is no actual change in implementation for this requirement.

Tag	Requirement	Feature	Use Cases	Other Design Elements
SR3.6.1.5.1	Cameras that do not respond shall be identified as having communications problems.	Video	Manage Video : Control NTCIP Camera	This is marked as implemented to force retesting with the new H.264 codecs, but there is no actual change in implementation for this requirement.
SR3.6.1.10	The system shall support control of COHU MPC cameras, COHU 3955 cameras, NTCIP compatible cameras, and Surveyor VFT cameras.	Video	Manage Video : Control COHUCamera, Control SVFT Camera, Control NTCIP Camera	This is marked as implemented to force retesting with the new H.264 codecs, but there is no actual change in implementation for this requirement.
SR3.6.1.11	The system shall support standards based protocols for communicating with camera control sending devices wherever possible, except when proprietary protocols are the only option for communicating with vendor devices.	Video	N/A	This is marked as implemented to force retesting with the new H.264 codecs, but there is no actual change in implementation for this requirement.
SR3.6.1.11.1	The system shall support camera control over an IP network.	Video	Manage Video : Control Camera	This is marked as implemented to force retesting with the new H.264 codecs, but there is no actual change in implementation for this requirement.
SR3.6.1.11.1.1	The system shall support communications with a sending device for IP camera control.	Video	Manage Video : Control Camera	This is marked as implemented to force retesting with the new H.264 codecs, but there is no actual change in implementation for this requirement.
SR3.6.3	The system shall allow a suitably privileged operator to control wall monitor assignments.	Video	Manage Video : Display Camera on Monitor, Remove Camera from Monitor	N/A
SR3.6.3.10	CHART II shall support standards based protocols for communicating with video sending/receiving devices wherever possible, except where proprietary protocols are the only option for communicating with vendor devices.	Video	N/A	N/A
SR3.6.3.10.1	CHART II shall support video distribution from sending devices/cameras to receiving devices/monitors over IP.	Video	Manage Video : Display Camera on Monitor	

Tag	Requirement	Feature	Use Cases	Other Design Elements
SR3.6.3.10.1.1	CHART II shall support communications with a sending device and a receiving device for distribution of IP video.	Video	Manage Video : Display Camera on Monitor	
SR3.6.3.11	Display Video Source On Monitor	Video	Manage Video : Display Camera on Monitor	
SR3.6.3.11.1	The system shall allow a user to display a camera image on an online local monitor if the user has rights to display images on a local monitor.	Video	Manage Video : Display Camera on Monitor	connect SD, connectFrom SD
SR3.6.3.11.2	The system shall allow a user to display a camera image on an online remote monitor if the user has rights to display images on a remote monitor.	Video	Manage Video : Display Camera on Monitor	connect SD, connectFrom SD
SR3.6.3.11.4	The system shall show the currently displayed video source or tour for each monitor on the Select Monitors screen.	Video		
SR3.6.3.12	Display Video Source On Monitors	Video	Manage Video : Display Camera on Monitor	N/A
SR3.6.3.12.1	The system shall allow a user to concurrently display the same camera image on any number of online local monitors if the user has rights to display images on a local monitor.	Video	Manage Video : Display Camera on Monitor	connect SD, connectFrom SD
SR3.6.3.12.2	The system shall allow a user to concurrently display the same camera image on any number of online remote monitors if the user has rights to display images on a remote monitor.	Video	Manage Video : Display Camera on Monitor	connect SD, connectFrom SD
SR3.6.3.13	Remove Video	Video	Manage Video : Remove Camera from Monitor	N/A

Tag	Requirement	Feature	Use Cases	Other Design Elements
SR3.6.3.13.1	The system shall allow a suitably privileged user to remove a camera image from a specified monitor.	Video	Manage Video : Remove Camera from Monitor	
SR4	MANAGE EVENTS		N/A	N/A (Heading)
SR4.1	Record and Update Event Status		N/A	N/A
SR4.1.19	The system shall allow a suitably privileged user to request a list of traffic events in the open state only.		N/A	
SR4.1.19.1	The Open Event List shall indicate if an event is a Linked Event	Import	View Linked Event Info on Event List Pages	GUIServletUsermgmtClasses CD, GUIDataTrafficEventClasses CD
SR4.1.19.1.1	The Open Event List shall indicate which values were obtained from an External Event and therefore were not entered by an ATMS user.	Import	View Linked Event Info on Event List Pages	GUIServletUsermgmtClasses CD, GUIDataTrafficEventClasses CD
SR4.1.19.1.2	The Open Event List shall indicate if any External Event Change Indicator is set for a Linked Event. (It does not have to indicate which ones are set.)	Import	View Linked Event Info on Event List Pages	GUIServletUsermgmtClasses CD, GUIDataTrafficEventClasses CD
SR4.1.19.2	The Open Event List page shall contain open External Events which are not yet associated with a Linked Event, have their Interesting flag set, and are located within the Operations Center's AOR.	Import	View Linked Event Info on Event List Pages	GUIServletUsermgmtClasses CD, GUIDataTrafficEventClasses CD
SR4.1.20	The system shall allow a suitably privileged user to request a list of traffic events in the open or closed states only.		N/A	
SR4.1.20.1	The Open/Closed Event List shall indicate if an event is a Linked Event.	Import	View Linked Event Info on Event List Pages	GUIServletUsermgmtClasses CD, GUIDataTrafficEventClasses CD

Tag	Requirement	Feature	Use Cases	Other Design Elements
SR4.1.20.1.1	The Open/Closed Event List shall indicate which values were obtained from an External Event and therefore were not entered by an ATMS user.	Import	View Linked Event Info on Event List Pages	GUIServletUsermgmtClasses CD, GUIDataTrafficEventClasses CD
SR4.1.20.1.2	The Open/Closed Event List pages shall indicate if any External Event Change Indicator is set for a Linked Event; not necessarily which ones are set.	Import	View Linked Event Info on Event List Pages	GUIServletUsermgmtClasses CD, GUIDataTrafficEventClasses CD
SR4.1.20.2	The Open/Closed Event List shall contain External Events which are not yet associated with a Linked Event, have their Interesting flag set, and are located within the Operations Center's AOR.	Import	View Linked Event Info on Event List Pages	GUIServletUsermgmtClasses CD, GUIDataTrafficEventClasses CD
SR4.1.25	The system shall maintain an External Event Change Indicator for each section of a Linked Event capable of being updated by an External Event. (An External Event Change Indicator informs a user of a change to an External Event section that has not yet been acknowledged by an ATMS user.)	Import	Set External Gen Info Update Indicator, Set External Location Update Indicator, Set External Incident Info Update Indicator, Set External Lane Config Update indicator.	TrafficEventManagementClasses CD, TrafficEventGroup.updateLinkedCHARTEventData SD
SR4.1.25.1	The system shall display an External Event Change Indicator on a Linked Event detail page when any value in the corresponding External Event's section changes. (This occurs whether the Linked Event is currently overriding the External Event values for this section or not.)	Import	Set External Gen Info Update Indicator, Set External Location Update Indicator, Set External Incident Info Update Indicator, Set External Lane Config Update indicator.	TrafficEventManagementClasses CD

Tag	Requirement	Feature	Use Cases	Other Design Elements
SR4.1.25.2	The system shall indicate that an External Event has changed only if the change occurs in a Linked Event's section whose change indicator is enabled in the system configuration.	Import	Set External Gen Info Update Indicator, Set External Location Update Indicator, Set External Incident Info Update Indicator, Set External Lane Config Update indicator.	TrafficEventManagementClasses CD, TrafficEventGroup.updateLinkedCHARTEventData SD
SR4.1.25.2.1	The system shall allow a user with the Configure System right to enable or disable future External Event Change Indicators in the system profile on a system-wide basis. (For example, there is a system profile property to turn off future External Event Change Indicators for Lane Configuration data for all Linked Events in the system)	Import	Configure External Event Update Indicators	
SR4.1.25.3	The system shall clear External Event Change Indicators in Linked Events.	Import	Acknowledge External Event Update Indicator	TrafficEventManagementClasses CD, TrafficEventModuleClasses CD, TrafficEventGroup.setMethods SD
SR4.1.25.3.1	The system shall allow a user with the Manage Event right to clear an External Event Change Indicator in a Linked Event by modifying values in the Linked Event's section.	Import	Acknowledge External Event Update Indicator	TrafficEventManagementClasses CD, TrafficEventModuleClasses CD, TrafficEventGroup.setMethods SD
SR4.1.25.3.2	The system shall allow a user with the Manage Event right to clear an External Event's Change Indicator in a Linked Event by acknowledging the change without modifying values in the Linked Event's section.	Import	Acknowledge External Event Update Indicator	TrafficEventManagementClasses CD, TrafficEventModuleClasses CD, TrafficEventGroup.linkedCHARTEventMethods SD

Tag	Requirement	Feature	Use Cases	Other Design Elements
SR4.1.25.3.3	The system shall clear all External Event's Change Indicators in a Linked Event when a user breaks the bond between a Linked Event and its External Event.	Import	Acknowledge External Event Update Indicator	TrafficEventManagementClasses CD, TrafficEventModuleClasses CD, TrafficEventFactory.linkAndUnlinkTrafficEvents SD
SR4.1.25.3.4	The system shall clear all External Event's Change Indicators in a Linked Event when the Linked Event is closed.	Import	Acknowledge External Event Update Indicator	TrafficEventManagementClasses CD, TrafficEventModuleClasses CD, TrafficEventGroup.close SD
SR4.1.26	The system shall record the scope-of-impact event state.	Exporter	Manage Public Web Alert	
SR4.1.26.1	The scope-of-impact event state shall include Event Location (default), Route, Countywide, Statewide, and Regional (multi-state).	Exporter	Manage Public Web Alert	
SR4.1.26.2	The system shall export the scope-of-impact for each event.	Exporter	Manage Public Web Alert	
SR4.1.27	The system shall record the optional Public Audio Alert Text for events.	Exporter	Manage Public Web Alert	
SR4.1.27.1	The system shall export the Public Audio Alert Text if the Public Audio Alert flag is set.	Exporter	Manage Public Web Alert	
SR4.1.27.2	The system shall export Public Audio Alert Text as text (as opposed to an audio format).	Exporter	Manage Public Web Alert	
SR4.1.28	The system shall record up to one selected Public Alert Category	Exporter	Manage Public Web Alert	
SR4.1.28.1	The system shall export the Public Alert Category if any is selected.	Exporter	Manage Public Web Alert	
SR4.2	OPEN EVENT		N/A	N/A (Heading)
SR4.2.1	The system shall allow a suitably privileged user to create a new event.		Create Traffic Event	N/A (Existing functionality)

Tag	Requirement	Feature	Use Cases	Other Design Elements
SR4.2.1.11	The system shall allow a user with the Manage Event right to manage Linked Events. (A Linked Event is a non-External, non-Pending Event that optionally derives values from an External Event.)	Import	N/A Header	
SR4.2.1.11.1	The system shall allow a user with the Manage Event right to create a Linked Event from an External Event.	Import	Create Linked CHART Event From External Event	TrafficEventManagementClasses CD, TrafficEventFactory.createLinkedChartEvent SD
SR4.2.1.11.2	The system shall allow users to link an open, non-External, non-Pending Event to an External Event of the same event type - even if the External Event is closed provided it has not been archived off of the system.	Import	Link CHART Event to External Event	TrafficEventManagementClasses CD, TrafficEventFactory.linkAndUnlinkTrafficEvents SD
SR4.2.1.11.3	The system shall prevent users from linking any event to more than one other event at a time.	Import	Link CHART Event to External Event	TrafficEventManagementClasses CD, TrafficEventModuleClasses CD, TrafficEventFactory.linkAndUnlinkTrafficEvents SD
SR4.2.1.11.5	The system shall allow users to control the flow of values from an External Event's Lane Configuration Section to its Linked Event.	Import	Override External Event Info	TrafficEventManagementClasses CD, TrafficEventGroup.updateLinkedChartEventData SD, TrafficEventGroup.linkedChartEventMethods SD
SR4.2.1.11.5.1	The system shall allow a user with the Manage Event right to enable a given Linked Event to automatically update its values for any combination of sections from an External Event. (The system will continue to update the Linked Event sections from the External Event as long as the Linked Event is open and updates are enabled for a given sections.)	Import	Override External Event Info	TrafficEventManagementClasses CD, TrafficEventGroup.updateLinkedChartEventData SD, TrafficEventGroup.linkedChartEventMethods SD

Tag	Requirement	Feature	Use Cases	Other Design Elements
SR4.2.1.11.5.2	The system shall allow a user with the Manage Event right to disable a given Linked Event from automatically updating its values from an External Event for any combination of event sections thus allowing users to again modify those sections. (The Linked Event remains linked to the External Event even if all section updates are disabled.)	Import	Override External Event Info	TrafficEventManagementClasses CD, TrafficEventGroup.updateLinkedChartEventData SD, TrafficEventGroup.linkedChartEventMethods SD
SR4.2.1.11.5.3	The system shall allow users to control the flow of values from an External Event's General Info Section to its Linked Event.	Import	Override External Event Info	TrafficEventManagementClasses CD, TrafficEventGroup.updateLinkedChartEventData SD, TrafficEventGroup.linkedChartEventMethods SD
SR4.2.1.11.5.4	The system shall allow users to control the flow of values from an External Event's Location Section to its Linked Event.	Import	Override External Event Info	TrafficEventManagementClasses CD, TrafficEventGroup.updateLinkedChartEventData SD, TrafficEventGroup.linkedChartEventMethods SD
SR4.2.1.11.5.5	The system shall allow users to control the flow of values from an External Event's Incident Information Section to its Linked Event.	Import	Override External Event Info	TrafficEventManagementClasses CD, TrafficEventGroup.updateLinkedChartEventData SD, TrafficEventGroup.linkedChartEventMethods SD
SR4.2.1.11.6	The system shall allow users to view the External Event values for an event section from the Linked Event's details page if that section has been overridden.	Import	View External Event Data From Linked Event Details Page	
SR4.2.1.11.7	The system shall allow users to view the Linked Event values for a field group from the External Event's details page if that field group has been overridden.	Import	View Linked Event Data From External Event Details Page	

Tag	Requirement	Feature	Use Cases	Other Design Elements
SR4.2.1.11.8	The system shall allow a user with the Manage Event right to break the bond between a Linked Event and an External Event. (Once broken, the Linked Event becomes a normal event and changes to External Event values no longer update the now unlinked event.)	Import	Remove Link Between CHART Event and External Event	TrafficEventManagementClasses CD, TrafficEventFactory.linkAndUnlinkChartEventsSD,
SR4.2.2	RECORD EVENT DETAILS		N/A	
SR4.2.2.2	SPECIFY LOCATION(S) AND IMPACT	MD511	N/A	
SR4.2.2.2.11	The system shall allow the user to specify, while editing a traffic event, whether the traffic event warrants display of a traffic alert on the external web site.	MD511	N/A	
SR4.2.2.2.11.1	The system shall allow the user to control a Public Alert Text flag to indicate if the public alert text for this event is ready for export to external systems.	MD511	Manage Public Web Alert	
SR4.2.2.2.18	While editing a traffic event, the system shall allow a user to indicate an event's scope-of-impact. (For example, an incident whose location is a single point but whose impact affects multiple states.)	MD511	Manage Public Web Alert	Export MD511 Fields:SD
SR4.2.2.2.18.1	The choices for an event's scope-of-impact shall be Event Location (default), Route, Countywide, Statewide, and Regional (multi-state).	MD511	Manage Public Web Alert	TrafficEventManagementClasses:CD
SR4.2.2.2.19	While editing a traffic event, the system shall allow a user with the Manage Public Alert right to specify the text of an optional public audio alert for export to external systems.	MD511	Manage Public Web Alert	Export MD511 Fields:SD

Tag	Requirement	Feature	Use Cases	Other Design Elements
SR4.2.2.2.19.1	The system shall allow the user to control a Public Audio Alert flag to indicate if the public audio alert text is ready for export to external systems.	MD511	Manage Public Web Alert	Export MD511 Fields:SD
SR4.2.2.2.19.2	The system shall allow a user with the Manage Public Alert right to make pronunciation substitutions to the Public Audio Text from a list of word / pronunciation pairs.	MD511	Manage Public Web Alert	
SR4.2.2.2.19.3	The system shall allow a user with the Manage Public Alert right to preview what the Public Audio Alert Text might sound like when converted to audio.	MD511	Manage Public Web Alert	
SR4.2.2.2.20	While editing a traffic event, the system shall allow a user with the Manage Public Alert right to specify up to one Public Alert Category for export to external systems.	Exporter	Manage Public Web Alert	
SR4.2.2.6	CAPTURE RELATED EVENTS		N/A	
SR4.2.2.6.5	The system shall allow a suitably privileged user to merge open events.		N/A	
SR4.2.2.6.5.7	The system shall prevent the merging of a linked event with any other event.	Import	Merge Events	

Tag	Requirement	Feature	Use Cases	Other Design Elements
SR4.2.3	DEPLOY RESOURCES. The system shall allow the user to view the pre-defined decision support plans to suggest the course of action and notifications, and execute the selected (or modified) course of action. The ability to record the deploying of the resources only applies to user generated events – not External Events. *	Decision Support	N/A	N/A (Included for context)
SR4.2.3.2	EVALUATE EVENT RESPONSE RECOMMENDATIONS. The system shall display the most appropriate corresponding recommended response plan from the pre-defined decision support plans, based on the event type, conditions, day of week and time of day (e.g., to determine closest open maintenance shop), location, and area of responsibility.	Decision Support	N/A	N/A (Included for context)
SR4.2.3.2.1	The system shall display the recommended DMS, HAR, Detector, CCTV camera and monitor usage and the corresponding message/control, based on the event location	Decision Support	Request suggested cameras.	SD TrafficEventGroup.requestCameraSuggestions
SR4.2.3.2.1.2	The system shall consider all applicable devices located within a configurable radius of the traffic event.	Decision Support	MapAndGISUses.ViewCloseDevicesOnMap MapAndGISUses.ViewDevicesCloseToTrafficEvent	N/A
SR4.2.3.2.1.2.3	The system shall include both CHART and external devices as applicable that are located within the specified radius of the traffic event.	Decision Support		N/A

Tag	Requirement	Feature	Use Cases	Other Design Elements
SR4.2.3.2.1.2.3.1	The system shall suggest messages for CHART DMS devices within a configurable radius of a CHART user created traffic event.	Decision Support	Request Decision Support Messages: Suggest DMS Messages	Screenshot HMI: Figure 4-25 Screenshot HMI: Figure 4-29 DecSuppIDLClasses CD DecisionSupportSvcUtilDSInfoClasses CD DecisionSupportSvcUtilDSPluginClasses CD GUIDecSuppDataClasses CDTrafficEventGroup.requestSuggestions SD
SR4.2.3.2.1.2.3.1.4	Suggested DMS devices shall be scored such that they are displayed in a predictable order.	Decision Support	Request Decision Support Messages: Suggest DMS Messages	Screenshot HMI: Figure 4-25 DecisionSupportSvcUtilDSInfoClasses CD
SR4.2.3.2.1.2.3.1.4.1	DMSs shall be scored based on the following route attributes (listed in order of priority): the presence of a U-turn in the route from the DMS to the traffic event, the distance category of the DMS (i.e. immediate, near or far) based on the route from the DMS to the traffic event, the number of turns in the route from the DMS to the traffic event, the length of the route from the DMS to the traffic event, and the type of routes in the route from the DMS to the traffic event.	Decision Support	Request Decision Support Messages: Suggest DMS Messages	Screenshot HMI: Figure 4-28 DecSuppIDLClasses CD DecisionSupportClasses CD DecisionSupportSvcUtilDSInfoClasses CD DecisionSupportSvcUtilDSPluginClasses CD GUIDecSuppDataClasses CD
SR4.2.3.2.1.2.3.1.4.1.1	DMSs with no U-turns in the route from the DMS to the traffic event shall be scored higher than those with a U-turn in the route.	Decision Support	Request Decision Support Messages: Suggest DMS Messages	DecSuppIDLClasses CD DecisionSupportSvcUtilDSInfoClasses CD GUIDecSuppDataClasses CD
SR4.2.3.2.1.2.3.1.4.1.2	DMSs within the configured near distance based on the route from the DMS to the traffic event shall be scored higher than those not within the configured near distance.	Decision Support	Request Decision Support Messages: Suggest DMS Messages	DecSuppIDLClasses CD DecisionSupportSvcUtilDSInfoClasses CD GUIDecSuppDataClasses CD
SR4.2.3.2.1.2.3.1.4.1.3	DMSs with fewer turns in the route from the DMS to the traffic event shall be scored higher than those with more turns in the route.	Decision Support	Request Decision Support Messages: Suggest DMS Messages	DecSuppIDLClasses CD DecisionSupportSvcUtilDSInfoClasses CD GUIDecSuppDataClasses CD

Tag	Requirement	Feature	Use Cases	Other Design Elements
SR4.2.3.2.1.2.3.1.4.1.4	DMSs with a shorter route from the DMS to the traffic event shall be scored higher than those with a longer route.	Decision Support	Request Decision Support Messages: Suggest DMS Messages	DecSuppIDLClasses CD DecisionSupportSvcUtilDSInfoClasses CD GUIDecSuppDataClasses CD
SR4.2.3.2.1.2.3.1.4.1.5	DMSs with a route type in the route from the DMS to the traffic event that is expected to have a higher impact on drivers shall be scored higher than those with a route type in the route that is expected to have a lesser impact (route types in highest to lowest impact order are: Interstate, State, US Route, County, US Government, Municipal, Other Public, Other State Road, Other, and Unknown).	Decision Support	Request Decision Support Messages: Suggest DMS Messages	DecSuppIDLClasses CD DecisionSupportSvcUtilDSInfoClasses CD GUIDecSuppDataClasses CD
SR4.2.3.2.1.2.3.1.4.2	DMSs with a score equal to or greater than a configurable cutoff shall be initially displayed to the operator.	Decision Support	Request Decision Support Messages: Suggest DMS Messages	DecisionSupportSvcUtilDSInfoClasses CD
SR4.2.3.2.1.2.3.1.4.2.1	DMSs with a score less than a configurable cutoff shall be initially hidden and displayed only if the operator chooses to view them.	Decision Support	Request Decision Support Messages: Suggest DMS Messages	DecisionSupportSvcUtilDSInfoClasses CD
SR4.2.3.2.1.2.3.3	The system shall suggest that the user view cameras that match the configured camera search distance criteria.	Decision Support	Request Decision Support Messages: Suggest Viewing Cameras	Screenshot HMI: Figure 4-29 DecSuppIDLClasses CD DecisionSupportSvcUtilDSInfoClasses CD DecisionSupportSvcUtilDSPluginClasses CD GUIDecSuppDataClasses CDTrafficEventGroup.requestSuggestions SD
SR4.2.3.2.1.2.3.3.5	Camera suggestions shall be scored such that they are displayed in a predictable order.	Decision Support	Request Decision Support Messages: Suggest Viewing Cameras	DecisionSupportSvcUtilDSInfoClasses CD

Tag	Requirement	Feature	Use Cases	Other Design Elements
SR4.2.3.2.1.2.3.3.5.1	Cameras within the configured immediate distance based on the straight-line distance from the camera to the traffic event shall be scored higher than those not within the immediate distance.	Decision Support	Request Decision Support Messages: Suggest Viewing Cameras	DecisionSupportClasses CD DecisionSupportSvcUtilDSInfoClasses CD DecisionSupportSvcUtilDSPluginClasses CD GUIDecSuppDataClasses CD
SR4.2.3.2.1.2.3.3.5.1.1	Cameras within the immediate distance shall be scored by the straight-line distance from the camera to the traffic event.	Decision Support	Request Decision Support Messages: Suggest Viewing Cameras	DecisionSupportClasses CD DecisionSupportSvcUtilDSInfoClasses CD DecisionSupportSvcUtilDSPluginClasses CD GUIDecSuppDataClasses CD
SR4.2.3.2.1.2.3.3.5.2	Cameras with a score equal to or greater than a configurable cutoff shall be initially displayed to the operator.	Decision Support	Request Decision Support Messages: Suggest Viewing Cameras	DecisionSupportSvcUtilDSInfoClasses CD
SR4.2.3.2.1.2.3.3.5.2.1	Cameras with a score less than a configurable cutoff shall be initially hidden and displayed only if the operator chooses to view them.	Decision Support	Request Decision Support Messages: Suggest Viewing Cameras	DecisionSupportSvcUtilDSInfoClasses CD
SR4.2.3.2.1.2.3.3.5.3	Cameras within the configured near and far distances based on the route from the camera to the traffic event shall be scored based on the following route attributes (listed in order of priority): the presence of a U-turn in the route from the camera to the traffic event, the distance category of the camera (i.e. near or far) based on the route from the camera to the traffic event, the number of turns in the route from the camera to the traffic event, the length of the route from the camera to the traffic event, and the type of routes in the route from the camera to the traffic event.	Decision Support	Request Decision Support Messages: Suggest Viewing Cameras	DecSuppIDLClasses CD DecisionSupportClasses CD DecisionSupportSvcUtilDSInfoClasses CD DecisionSupportSvcUtilDSPluginClasses CD GUIDecSuppDataClasses CD

Tag	Requirement	Feature	Use Cases	Other Design Elements
SR4.2.3.2.1.2.3.3.5.3.1	Cameras with no U-turns in the route from the camera to the traffic event shall be scored higher than those with a U-turn in the route.	Decision Support	Request Decision Support Messages: Suggest Viewing Cameras	DecSuppIDLClasses CD GUIDecSuppDataClasses CD
SR4.2.3.2.1.2.3.3.5.3.2	Cameras within the configured near distance based on the route from the camera to the traffic event shall be scored higher than those not within the configured near distance.	Decision Support	Request Decision Support Messages: Suggest Viewing Cameras	DecSuppIDLClasses CD GUIDecSuppDataClasses CD
SR4.2.3.2.1.2.3.3.5.3.3	Cameras with fewer turns in the route from the camera to the traffic event shall be scored higher than those with more turns in the route.	Decision Support	Request Decision Support Messages: Suggest Viewing Cameras	DecSuppIDLClasses CD GUIDecSuppDataClasses CD
SR4.2.3.2.1.2.3.3.5.3.4	Cameras with a shorter route from the camera to the traffic event shall be scored higher than those with a longer route.	Decision Support	Request Decision Support Messages: Suggest Viewing Cameras	DecSuppIDLClasses CD GUIDecSuppDataClasses CD
SR4.2.3.2.1.2.3.3.5.3.5	Cameras with a route type in the route from the camera to the traffic event that is expected to have a higher impact on drivers shall be scored higher than those with a route type in the route that is expected to have a lesser impact (route types in highest to lowest impact order are: Interstate, State, US Route, County, US Government, Municipal, Other Public, Other State Road, Other, and Unknown).	Decision Support	Request Decision Support Messages: Suggest Viewing Cameras	DecSuppIDLClasses CD GUIDecSuppDataClasses CD
SR4.2.3.2.1.2.3.3.6	The system shall suggest that the user view a camera only if the device is eligible for decision support (see SR1.5.2.1.18.7.6).	Decision Support	Configure Devices: Configure Decision Support Eligible Request Decision Support Messages: Suggest Viewing Cameras	Screenshot HMI: Figure 4-50 Screenshot HMI: Figure 4-51 CameraControlIDLClasses CD

Tag	Requirement	Feature	Use Cases	Other Design Elements
SR4.2.3.2.1.2.3.4	The system shall suggest messages for CHART HAR devices within a configurable radius of a CHART user created traffic event.	Decision Support	Request Decision Support Suggestions: Suggest HAR Messages	Screenshot HMI: Figure 4-26 Screenshot HMI: Figure 4-29 DecSuppIDLClasses CD DecisionSupportSvcUtilDSInfoClasses CD DecisionSupportSvcUtilDSPluginClasses CD GUIDecSuppDataClasses CDTrafficEventGroup.requestSuggestions SD
SR4.2.3.2.1.2.3.4.5	Suggested HAR devices shall be scored such that they are displayed in a predictable order.	Decision Support	Request Decision Support Suggestions: Suggest HAR Messages	Screenshot HMI: Figure 4-26 DecisionSupportSvcUtilDSInfoClasses CD
SR4.2.3.2.1.2.3.4.5.1	HARs within the configured immediate distance based on the straight-line distance from the HAR to the traffic event shall be scored higher than those not within the immediate distance.	Decision Support	Request Decision Support Suggestions: Suggest HAR Messages	DecisionSupportClasses CD DecisionSupportSvcUtilDSInfoClasses CD DecisionSupportSvcUtilDSPluginClasses CD GUIDecSuppDataClasses CD
SR4.2.3.2.1.2.3.4.5.1.1	HARs within the immediate distance shall be scored by the straight-line distance from the HAR to the traffic event.	Decision Support	Request Decision Support Suggestions: Suggest HAR Messages	DecisionSupportClasses CD DecisionSupportSvcUtilDSInfoClasses CD DecisionSupportSvcUtilDSPluginClasses CD GUIDecSuppDataClasses CD
SR4.2.3.2.1.2.3.4.5.4	HARs within the configured near and far distances based on the route from the HAR to the traffic event shall be scored based on the following route attributes (listed in order of priority): the presence of a U-turn in the route from the HAR to the traffic event, the distance category of the HAR (i.e. near or far) based on the route from the HAR to the traffic event, the number of turns in the route from the HAR to the traffic event, the length of the route from the HAR to the traffic event, and the type of routes in the route from the HAR to the traffic event.	Decision Support	Request Decision Support Suggestions: Suggest HAR Messages	DecSuppIDLClasses CD DecisionSupportClasses CD DecisionSupportSvcUtilDSInfoClasses CD DecisionSupportSvcUtilDSPluginClasses CD GUIDecSuppDataClasses CD

Tag	Requirement	Feature	Use Cases	Other Design Elements
SR4.2.3.2.1.2.3.4.5.4.1	HARs with no U-turns in the route from the HAR to the traffic event shall be scored higher than those with a U-turn in the route.	Decision Support	Request Decision Support Suggestions: Suggest HAR Messages	DecSuppIDLClasses CD GUIDecSuppDataClasses CD
SR4.2.3.2.1.2.3.4.5.4.2	HARs within the configured near distance based on the route from the HAR to the traffic event shall be scored higher than those not within the configured near distance.	Decision Support	Request Decision Support Suggestions: Suggest HAR Messages	DecSuppIDLClasses CD GUIDecSuppDataClasses CD
SR4.2.3.2.1.2.3.4.5.4.3	HARs with fewer turns in the route from the HAR to the traffic event shall be scored higher than those with more turns in the route.	Decision Support	Request Decision Support Suggestions: Suggest HAR Messages	DecSuppIDLClasses CD GUIDecSuppDataClasses CD
SR4.2.3.2.1.2.3.4.5.4.4	HARs with a shorter route from the HAR to the traffic event shall be scored higher than those with a longer route.	Decision Support	Request Decision Support Suggestions: Suggest HAR Messages	DecSuppIDLClasses CD GUIDecSuppDataClasses CD
SR4.2.3.2.1.2.3.4.5.4.5	HARs with a route type in the route from the HAR to the traffic event that is expected to have a higher impact on drivers shall be scored higher than those with a route type in the route that is expected to have a lesser impact (route types in highest to lowest impact order are: Interstate, State, US Route, County, US Government, Municipal, Other Public, Other State Road, Other, and Unknown).	Decision Support	Request Decision Support Suggestions: Suggest HAR Messages	DecSuppIDLClasses CD GUIDecSuppDataClasses CD
SR4.2.3.2.1.2.3.4.5.5	HARs with a score equal to or greater than a configurable cutoff shall be initially displayed to the operator.	Decision Support	Request Decision Support Suggestions: Suggest HAR Messages	Screenshot HMI: Figure 4-26 DecisionSupportSvcUtilDSInfoClasses CD

Tag	Requirement	Feature	Use Cases	Other Design Elements
SR4.2.3.2.1.2.3.4.5.5.1	HARs with a score less than a configurable cutoff shall be initially hidden and displayed only if the operator chooses to view them.	Decision Support	Request Decision Support Suggestions: Suggest HAR Messages	Screenshot HMI: Figure 4-26 DecisionSupportSvcUtilDSInfoClasses CD
SR4.2.3.2.1.2.10	The system shall recommend 0 or more messages for each DMS that meets all device usage criteria (as specified in the immediate sub-requirements).	Decision Support	Request Decision Support Suggestions: Suggest HAR Messages	Screenshot HMI: Figure 4-27 DecisionSupportSvcUtilDSInfoClasses CD DecSuppTemplatesClasses CD GUIDecSuppTemplatesDataClasses DecisionSupportManager.findPertinentObjects SD DecisionSupportManager.getLocationAndExitInfo SD TrafficEventGroup.requestSuggestions SD
SR4.2.3.2.1.2.10.1	The system shall create DMS message suggestions based on configured message templates.	Decision Support	Respond to Traffic Event Use Case: Request Suggested DMS Messages	Screenshot HMI: Figure 4-27 DecisionSupportManager:applyTemplate SD DecisionSupportManager:generateSuggestionsForDMS SD ResponsePlanReqHdlr:getSuggDMSActions SD ResponsePlanReqHdlr:viewSuggActionsCommandStatus SD ResponsePlanReqHdlr:viewSuggDMSActions SD
SR4.2.3.2.1.2.10.1.1	The system shall create a DMS message suggestion for each message template that matches the DMS route attributes (e.g. U-turns, number of turns, and route types in the route), distance category, geometry and the type of the traffic event provided that the template tags can successfully be substituted with data from the traffic event as specified in the immediate sub-requirements.	Decision Support	Request Decision Support Suggestions: Suggest DMS Messages	DecSuppIDLClasses CD MsgTemplateManagementClasses CD DecisionSupportSvcUtilDSInfoClasses CD DecisionSupportSvcUtilDSPluginClasses CD DecSuppTemplatesClasses CD GUIDecSuppDataClasses CD GUIDecSuppTemplatesDataClasses CD
SR4.2.3.2.1.2.10.3	The system shall present all suggested messages for a DMS ordered by a score (highest to lowest) based on specificity of the message suggestion.	Decision Support	Respond to Traffic Event Use Case: Request Suggested DMS Messages	Screenshot: HMI Figure 3 Screenshot: HMI Figure 8 DecisionSupportDataClasses CD chartlite.data.trafficevents.DecisionSupport CD chartlite.data.trafficevents_classes CD DecisionSupportManager.applyTemplates SD

Tag	Requirement	Feature	Use Cases	Other Design Elements
SR4.2.3.2.1.2.10.3.2	The system shall score a suggestion generated from a template with more stringent route attribute requirements higher than one with less stringent route attribute requirements (based on whether a U-turn is allowed in the route, the number of turns in the route, and the number of route types in the route).	Decision Support	Request Decision Support Suggestions: Suggest DMS Messages	DecSuppIDLClasses CD MsgTemplateManagementClasses CD GUIDecSuppTemplatesDataClasses CD
SR4.2.3.2.1.2.10.3.7	The system shall display summary scoring information about a message suggestion indicating the number of parameter tags and template filters (e.g. event type, route attributes, distance category) matched during scoring, if the operator has chosen to display scoring information.	Decision Support	Request Decision Support Suggestions: Suggest DMS Messages	DecSuppIDLClasses CD MsgTemplateManagementClasses CD GUIDecSuppTemplatesDataClasses CD
SR4.2.3.2.1.2.10.5	The system shall display a "No Message" message option that can be used to add a DMS to the response plan with no message.	Decision Support	Request Decision Support Suggestions: Suggest DMS Messages	Screenshot HMI: Figure 4-31
SR4.2.3.2.1.2.11	The system shall recommend 0 or more messages for each HAR that meets all device usage criteria (as specified in the immediate sub-requirements).	Decision Support	Request Decision Support Suggestions: Suggest HAR Messages	Screenshot HMI: Figure 4-26 Screenshot HMI: Figure 4-31 DecisionSupportSvcUtilDSInfoClasses CD DecisionSupportManager.findPertinentObjects SD DecisionSupportManager.getLocationAndExitInfo SD TrafficEventGroup.requestSuggestions SD
SR4.2.3.2.1.2.11.1	The system shall create HAR message suggestions based on configured message templates.	Decision Support	Suggest HAR Messages	DecisionSupportSvcUtilClasses CD HARUtilityDecSuppClasses CD HARUtilityDecSupportTemplateClasses CD TrafficEventModuleClasses CD UtilityObjectCacheTemplatesClasses CD HARDSInfo.applyTemplate SD HARDSInfo.generateSuggestions SD TrafficEventGroup.requestSuggestions SD

Tag	Requirement	Feature	Use Cases	Other Design Elements
SR4.2.3.2.1.2.11.1.1	The system shall create a HAR message suggestion for each message template that matches the HAR route attributes (e.g. U-turns, number of turns, and route types in the route), distance category, and the type of the traffic event provided that the template tags can successfully be substituted with data from the traffic event as specified in the sub-requirements.	Decision Support	Request Decision Support Suggestions: Suggest HAR Messages	DecSuppIDLClasses CD MsgTemplateManagementClasses CD DecisionSupportSvcUtilDSInfoClasses CD DecSuppTemplatesClasses CD GUIDecSuppDataClasses CD GUIDecSuppTemplatesDataClasses CD
SR4.2.3.2.1.2.11.3	The system shall present all suggested messages for a HAR ordered by a score (highest to lowest) based on specificity of the message suggestion.	Decision Support	Suggest HAR Messages	Screenshot: HMI Figure 4-52 IDLDecisionSupportClasses CD
SR4.2.3.2.1.2.11.3.2	The system shall score a suggestion generated from a template with more stringent route requirements higher than one with less stringent route requirements (based on whether a U-turn is allowed in the route, the number of turns in the route, and the number of route types in the route).	Decision Support	Request Decision Support Suggestions: Suggest HAR Messages	DecSuppIDLClasses CD MsgTemplateManagementClasses CD GUIDecSuppDataClasses CD GUIDecSuppTemplatesDataClasses CD
SR4.2.3.2.1.2.11.3.5	The system shall display summary scoring information about a message suggestion indicating the number of parameter tags and template filters (e.g. event type, route attributes, distance category) matched during scoring, if the operator has chosen to display scoring information.	Decision Support	Request Decision Support Suggestions: Suggest HAR Messages	DecSuppIDLClasses CD MsgTemplateManagementClasses CD GUIDecSuppDataClasses CD GUIDecSuppTemplatesDataClasses CD
SR4.2.3.2.1.2.11.4	The system shall display a "No Message" message option that can be used to add a HAR to the response plan with no message.	Decision Support	Request Decision Support Suggestions: Suggest HAR Messages	Screenshot HMI: Figure 4-31

Tag	Requirement	Feature	Use Cases	Other Design Elements
SR4.2.3.2.1.2.12	The system shall indicate if a recommended device is currently in the response plan.	Decision Support		Screenshot HMI: Figure 4-25 GUIDecSuppServletClasses CD ResponsePlanReqHdlr.selectSuggActionsForm SD
SR4.2.3.2.1.13	The system shall allow a user with the respond to traffic event right to view the recommended DMSs, HARs, and cameras on a response suggestions map.	Decision Support	Request Decision Support Suggestions: View Suggested Response Action on Map Request Decision Support Suggestions: View Suggested DMS on Map Request Decision Support Suggestions: View Suggested HAR on Map Request Decision Support Suggestions: View Suggested Camera on Map	Screenshot HMI: Figure 4-29 Screenshot HMI: Figure 4-30 GISUtilityClasses CD GUIDecSuppServletClasses CD GUIDecSuppJSClasses CD MapReqHdlr.getDecSuppSuggestionsDataJSON SD MapReqHdlr.getDecSuppSuggestionMapFeaturesJSON SD ResponsePlanReqHdlr.selectSuggActionsForm SD ResponseSuggestionsMap.vm.showRouteOnMap SD
SR4.2.3.2.1.13.1	The system shall allow a user with the respond to traffic event right to select devices (DMSs, HARs, and cameras) from the response suggestions map to be added to the response plan.	Decision Support	Request Decision Support Suggestions: Use Suggested Response Action Request Decision Support Suggestions: Add Suggested DMS Messages to Response Request Decision Support Suggestions: Add Suggested HAR Messages to Response Request Decision Support Suggestions: Add Suggested Cameras to Response	Screenshot HMI: Figure 4-32 GUIDecSuppServletClasses CD GUIDecSuppJSClasses CD MapReqHdlr.getDecSuppSuggestionsDataJSON SD MapReqHdlr.getDecSuppSuggestionMapFeaturesJSON SD ResponsePlanReqHdlr.selectSuggActionsForm SD

Tag	Requirement	Feature	Use Cases	Other Design Elements
SR4.2.3.2.1.13.1.1	DMSs and HARs selected from the response suggestions map will be assigned the "No Message" message option by default (see SR4.2.3.2.1.2.10.5 and SR4.2.3.2.1.2.11.4).	Decision Support	Request Decision Support Suggestions: Use Suggested Response Action Request Decision Support Suggestions: Add Suggested DMS Messages to Response Request Decision Support Suggestions: Add Suggested HAR Messages to Response	Screenshot HMI: Figure 4-31 GUIDecSuppServletClasses CD GUIDecSuppJSClasses CD MapReqHdlr.getDecSuppSuggestionsDataJSON SD MapReqHdlr.getDecSuppSuggestionMapFeaturesJSON SD ResponsePlanReqHdlr.selectSuggActionsForm SD
SR4.2.3.2.1.13.2	The system shall allow the operator to select whether the map or list-based suggestions are initially shown.	Decision Support		Screenshot HMI: Figure 4-38 GUIDecSuppServletClasses CD
SR4.2.3.2.1.14	The system shall determine the direction of the event based on the lane closures (either the direction in which lanes are closed or bi-directional if lanes are closed in both directions) or the direction of the event entered by the operator if no lane closures exist.	Decision Support	Request Decision Support Suggestions: Suggest DMS Messages Request Decision Support Suggestions: Suggest HAR Messages Request Decision Support Suggestions: Suggest Viewing Camera	DecisionSupportManager.getLocationAndExitInfo SD
SR4.2.3.2.9	The system shall allow a user with the configure system right to configure decision support settings.	Decision Support	N/A	N/A (unchanged in R10)
SR4.2.3.2.9.7	A user with the configure system functional right shall be able to maintain a set of message templates that will be used by the system when suggesting message content.	Decision Support	Configure Decision Support UCD: ConfigureMessageTemplate	N/A (unchanged in R10)

Tag	Requirement	Feature	Use Cases	Other Design Elements
SR4.2.3.2.9.7.3	A user with the configure system right shall be able to specify the device route attributes (e.g. U-turns, number of turns, and route types in the route) that a message template pertains to.	Decision Support	Configure Decision Support Message Templates: Add DMS Message Template Configure Decision Support Message Templates: Edit DMS Message Template Configure Decision Support Message Templates: Add HAR Message Template Configure Decision Support Message Templates: Edit HAR Message Template	Screenshot HMI: Figure 4-58 Screenshot HMI: Figure 4-59 DecSuppIDLClasses CD MsgTemplateManagementClasses CD GUIDecSuppTemplatesDataClasses CD
SR4.2.3.5	View Response Plan	Decision Support	N/A	N/A (Heading)
SR4.2.3.5.8	The system shall allow a user with the respond to traffic event right to view a traffic event response plan preview map	Decision Support	Configure Decision Support Use Case: View Response Plan Preview Map	Screenshot: HMI Figure 21 chartlite.servlet.trafficevents_classes CD ResponsePlanReqHdlr:viewResponsePlanPreview Map SD ResponsePlanReqHdlr:getResponsePlanDecSuppD ata SD MapViewSpecificClasses CD ResponsePlanPreviewMap:initialize SD ResponsePlanPreviewMap:handleMapDataJSON SD MapReqHdlr:getResponsePlanPreviewMapDataJS ON SD
SR4.2.3.5.8.4	The system shall indicate if a device that is currently in the traffic event response plan should not be included based on decision support rules by visually differentiating the preview map marker for that device.	Decision Support	Configure Decision Support Use Case: View Response Plan Preview Map	Screenshot: HMI Figure 21

Tag	Requirement	Feature	Use Cases	Other Design Elements
SR4.2.3.5.8.4.1	The system shall indicate if the response plan currently contains a DMS with a U-turn in the route from the DMS to the traffic event and on the same route as the traffic event by visually differentiating the preview map marker for that DMS.	Decision Support	Request Decision Support Suggestions: Preview Response Plan on Map	Screenshot HMI: Figure 4-48 DecSuppIDLClasses CD
SR4.2.3.5.8.5	The system shall indicate if a device that is currently not in the traffic event response plan should be added to the response plan based on decision support rules by visually differentiating the preview map marker for that device.	Decision Support	Request Decision Support Suggestions: Preview Response Plan on Map	Screenshot: HMI Figure 21
SR4.2.3.5.8.5.1	The system shall indicate if a DMS with no turns in the route from the DMS to the traffic event and within the configurable distance should be added to the traffic event response plan by visually differentiating the preview map marker for that DMS.	Decision Support	Request Decision Support Suggestions: Preview Response Plan on Map	DecSuppIDLClasses CD DecisionSupportClasses CD DecisionSupportSvcUtilDSPluginClasses CD GUIDecSuppDataClasses CD
SR4.2.3.5.8.5.2	The system shall indicate if a HAR that is within the immediate distance or has no turns in the route from the HAR to the traffic event and is within the configurable distance should be added to the traffic event response plan by visually differentiating the preview map marker for that HAR.	Decision Support	Request Decision Support Suggestions: Preview Response Plan on Map	Screenshot HMI: Figure 4-48 DecSuppIDLClasses CD DecisionSupportClasses CD DecisionSupportSvcUtilDSPluginClasses CD GUIDecSuppDataClasses CD
SR4.2.3.5.9	The system shall indicate if the response plan is currently missing a device that decision support rules indicate should be considered for response to the traffic event.	Decision Support	Configure Decision Support Use Case: View Devices That Should Be Considered for Response	Screenshot: HMI Figure 1 Screenshot: HMI Figure 15 chartlite.data.trafficevents_classes CD chartlite.servlet.trafficevents_classes CD

Tag	Requirement	Feature	Use Cases	Other Design Elements
SR4.2.3.5.9.1	The system shall indicate if the response plan is currently missing a DMS with no turns in the route from the DMS to the traffic event and within the configurable distance.	Decision Support	Configure Decision Support Suggestions: View Devices That Should be Considered for Response	Screenshot HMI: Figure 4-40 DecSuppIDLClasses CD DecisionSupportClasses CD DecisionSupportSvcUtilDSPluginClasses CD GUIDecSuppDataClasses CD
SR4.2.3.5.9.2	The system shall indicate if the response plan is currently missing a HAR that is within the immediate distance or has no turns in the route from the HAR to the traffic event and is within the configurable distance.	Decision Support	Configure Decision Support Suggestions: View Devices That Should be Considered for Response	Screenshot HMI: Figure 4-40 DecSuppIDLClasses CD DecisionSupportClasses CD DecisionSupportSvcUtilDSPluginClasses CD GUIDecSuppDataClasses CD
SR4.2.3.5.10	The system shall indicate if a device is currently in a traffic event response plan that decision support rules indicate should not be there.	Decision Support	Use Case: View Device Use Warnings	Screenshot: HMI Figure 1 Screenshot: HMI Figure 19 chartlite.data.trafficevents_classes CD chartlite.servlet.trafficevents_classes CD
SR4.2.3.5.10.1	The system shall indicate if the response plan currently contains a DMS with a U-turn in the route from the DMS to the traffic event and on the same route as a traffic event.	Decision Support	Configure Decision Support Suggestions: View Device Use Warning	Screenshot HMI: Figure 4-42 DecSuppIDLClasses CD GUIDecSuppDataClasses CD
SR4.3	RESPOND TO AND MONITOR EVENT		N/A	N/A (Heading)
SR4.3.5	VIEW EVENT LIST		N/A (Header)	N/A (Header)
SR4.3.5.5	The system shall provide an Open Events and Devices With Messages summary page.	Import	N/A Previously implemented	
SR4.3.5.5.1	The Open Events and Devices With Messages summary page shall indicate if an event is a Linked Event.	Import	View Linked Event Info on Event List Pages	
SR4.3.5.5.1.1	The Open Events and Devices With Messages summary page shall indicate which values were obtained from an External Event and therefore were not entered by	Import	View Linked Event Info on Event List Pages	

Tag	Requirement	Feature	Use Cases	Other Design Elements
	an ATMS user.			
SR4.3.5.5.1.2	The Open Events and Devices With Messages summary page shall indicate if any External Event Change Indicator is set for a Linked Event. (It does not have to indicate which ones are set.)	Import	View Linked Event Info on Event List Pages	
SR4.3.5.5.2	The Open Events and Devices With Messages summary page shall contain open External Events which are not yet associated with a Linked Event, have their Interesting flag set, and are located within the Operations Center's AOR.	Import	View Linked Event Info on Event List Pages	
SR6	PROVIDE TRAVELER INFORMATION		N/A	N/A (Heading)
SR6.1	BROADCAST INFORMATION. The system shall provide audible and visual or textual display messages to several types of devices. The content of the message and the trigger to activate the device (where necessary) are initiated (or calculated and dynamically updated in the case of queue length and travel time) by an earlier process.		N/A	N/A (General)
SR6.1.2	The system shall broadcast traveler information via DMSs.	DMS	N/A	N/A
SR6.1.2.5	The system shall allow a user with appropriate rights to manage traveler information messages for a DMS.	DMS, Travel Routes	N/A	N/A
SR6.1.2.5.1	The system shall allow a user with the Configure DMS right to create a traveler information message for use on a specific DMS.	DMS, Travel Routes	Add Traveler Information Message	DMSTravInfoMsgEditorData.parseRequestParameters SD, prototype (No other GUI-side changes are needed)

Tag	Requirement	Feature	Use Cases	Other Design Elements
SR6.1.2.5.1.5	When a new traveler information message is created for a DMS, the system shall by default initialize the message to be disabled.	DMS, Travel Routes	Add Traveler Information Message	Chart2DMSImpl.addDMSTravInfoMsg
SR6.1.2.5.1.6	The system shall allow the user to specify holiday settings for a traveler information message.	Travel Routes	Set Traveler Information Message Properties	DMSTravInfoMsgEditorData.parseRequestParameters SD, prototype
SR6.1.2.5.1.6.1	The system shall allow the user to specify that no holiday related settings apply to the traveler information message.	Travel Routes	Set Traveler Information Message Properties	DMSTravInfoMsgEditorData.parseRequestParameters SD, prototype
SR6.1.2.5.1.6.2	The system shall allow the user to specify that the traveler information message is to display only on holidays (see SR6.1.8.3), regardless of the day of week on which the holiday falls.	Travel Routes	Set Traveler Information Message Properties	DMSTravInfoMsgEditorData.parseRequestParameters SD, prototype
SR6.1.2.5.1.6.3	The system shall allow the user to specify that the traveler information message is to display only on holidays (see SR6.1.8.3), but only if the holiday falls on specified days of the week.	Travel Routes	Set Traveler Information Message Properties	DMSTravInfoMsgEditorData.parseRequestParameters SD, prototype
SR6.1.2.5.1.6.4	The system shall allow the user to specify that the traveler information message is to display only on non-holidays (see SR6.1.8.3), regardless of the day of week on which the non-holiday falls.	Travel Routes	Set Traveler Information Message Properties	DMSTravInfoMsgEditorData.parseRequestParameters SD, prototype
SR6.1.2.5.1.6.5	The system shall allow the user to specify that the traveler information message is to display only on non-holidays (see SR6.1.8.3), but only if the non-holiday falls on specified days of the week.	Travel Routes	Set Traveler Information Message Properties	DMSTravInfoMsgEditorData.parseRequestParameters SD, prototype

Tag	Requirement	Feature	Use Cases	Other Design Elements
SR6.1.2.5.1.7	The system shall allow the user specify the days of the week a traveler information message applies to, unless the message's holiday settings indicate the message applies to a holiday or non-holiday regardless of the day of week (see SR6.1.2.5.1.6.2 and .4)	Travel Routes	Set Traveler Information Message Properties	DMSTravInfoMsgEditorData.parseRequestParameters SD, prototype
SR6.1.2.5.1.8	The system shall log a message in the operations log when the user adds a traveler information message.	Travel Routes	Add Traveler Information Message	Chart2DMSImpl.addDMSTravInfoMsg SD
SR6.1.2.5.2	The system shall allow a user with the Configure DMS right to edit a traveler information message that has been previously configured for a DMS.	DMS	Edit Traveler Information Message	DMSTravInfoMsgEditorData.parseRequestParameters SD, prototype (No other GUI-side changes are needed)
SR6.1.2.5.2.2	After the user edits an enabled traveler information message, the system shall evaluate which enabled message should be active (if any) and change the active message if required. (This could involve deactivating one message and activating another) See SR6.1.7.7.	Travel Routes	Edit Traveler Information Message	Chart2DMSImpl.modifyDMSTravInfoMsg SD
SR6.1.2.5.2.3	The system shall log a message in the operations log when the user edits a traveler information message.	Travel Routes	Edit Traveler Information Message	Chart2DMSImpl.modifyDMSTravInfoMsg SD
SR6.1.2.5.3	The system shall allow the user to view the traveler information messages currently configured for a DMS.	DMS, Travel Routes	View DMS Traveler Information Messages	GUIDMSDataClasses CD, prototype
SR6.1.2.5.3.2	The system shall display the current status of each traveler information message.	DMS, Travel Routes	View DMS Traveler Information Messages	GUIDMSDataClasses CD, prototype

Tag	Requirement	Feature	Use Cases	Other Design Elements
SR6.1.2.5.3.2.1	The status of a traveler information message shall indicate if the message is enabled or disabled, and if enabled, it shall indicate if the message is active.	DMS, Travel Routes	View DMS Traveler Information Messages	GUIDMSDataClasses CD, prototype
SR6.1.2.5.3.5	The system shall show the day of week and holiday settings for each traveler information message.	Travel Routes	View DMS Traveler Information Messages	GUIDMSDataClasses CD, prototype
SR6.1.2.5.3.6	The system shall indicate the order of precedence it will use to select the active message when multiple messages are enabled and apply to the current day.	Travel Routes	View DMS Traveler Information Messages	GUIDMSDataClasses CD, prototype
SR6.1.2.5.4	The system shall allow a user with the Configure DMS right to remove a traveler information message from a DMS.	DMS, Travel Routes	Remove Traveler Information Message	Chart2DMSImpl.removeDMSTravInfoMsg SD. (No GUI-side changes are needed).
SR6.1.2.5.4.3	The system shall log a message in the operations log when the user removes a traveler information message.	Travel Routes	Remove Traveler Information Message	Chart2DMSImpl.removeDMSTravInfoMsg SD
SR6.1.2.5.5	The system shall allow a user with the Configure DMS right for the DMS's owning organization to set the order of the traveler information messages for a DMS. (The order of messages is used to establish precedence when multiple enabled messages could be active.)	Travel Routes	Set Traveler Information Message Order	DMSReqHdlr.modifyDMSTravInfoMsgOrder SD, prototype, CHart2DMSImpl.modifyDMSTravInfoMsgOrder SD
SR6.1.2.5.5.1	The system shall log a message in the operations log when the user changes the order of a traveler information message.	Travel Routes	Set Traveler Information Message Order	Chart2DMSImpl.modifyDMSTravInfoMsgOrder SD
SR6.1.2.5.6	The system shall allow a user with the "Change DMS Traveler Info Message State" right to enable or disable traveler information messages previously defined for a DMS.	Travel Routes	Enable Traveler Information Message Disable Traveler Information Message	Chart2DMSImpl.setTravInfoMsgEnabledFlag SD (No GUI-side changes are required)

Tag	Requirement	Feature	Use Cases	Other Design Elements
SR6.1.2.5.6.1	The system shall allow any number of traveler information message to be enabled for a single DMS. (If more than one message is enabled the system will determine which of the enabled messages will be the active message. See SR6.1.7.7)	Travel Routes	Enable Traveler Information Message	Chart2DMSImpl.setTravInfoMsgEnabledFlag SD
SR6.1.2.5.6.2	When a traveler information message for a DMS is enabled or disabled, the system shall evaluate which message should be the active message (if any) and perform message activation/deactivation as necessary. (See SR6.1.7.7)	Travel Routes	Enable Traveler Information Message Disable Traveler Information Message	Chart2DMSImpl.setTravInfoMsgEnabledFlag SD
SR6.1.2.5.6.3	The system shall log a message in the operations log when the user enables or disables a traveler information message.	Travel Routes	Enable Traveler Information Message Disable Traveler Information Message	Chart2DMSImpl.setTravInfoMsgEnabledFlag SD
SR6.1.2.6	The system shall allow a user with appropriate rights to manage the travel time display schedule for a DMS to specify the times of day travel time messages can be displayed.	DMS, Travel Routes	Set Time of Day Schedule for DMS Travel Time Messages	N/A - wording change to requirement only, no code changes.
SR6.1.2.7	The system shall allow the user to view a travel time summary page.	Travel Routes	View Travel Time Summary, Sort Travel Time Summary, Filter Travel Time Summary	GUIDMSTravTimeViewDynListClasses CD, DMSTravTimeViewSupporter.getDynListSubjects SD, prototype
SR6.1.2.7.1	The travel time summary page shall display information for each DMS in the system that is configured to display one or more travel time messages, whether or not any of those messages are currently enabled or active.	Travel Routes	View Travel Time Summary	DMSTravTimeViewSupporter.getDynListSubjects SD

Tag	Requirement	Feature	Use Cases	Other Design Elements
SR6.1.2.7.2	The system shall allow the following information to be viewed for each DMS on the travel time summary page: DMS Description/Location, Current Message, Beacon Status, Queued Messages, Flag that indicates if the DMS overrides the system travel time schedule, DMS status, Route, Direction, County, Owning Organization, Maintaining Organization, and a "Show On Map" link (if the DMS has a lat/long specified).	Travel Routes	View Travel Time Summary	GUIDMSTravTimeViewDynListClasses CD
SR6.1.2.7.2.1	The "show on map" link for a DMS on the travel time summary page shall show the location of the DMS on the home page map when clicked.	Travel Routes	View Travel Time Summary	Prototype only
SR6.1.2.7.3	The system shall allow the user to choose the columns to display on the travel time summary page.	Travel Routes	View Travel Time Summary	Prototype only
SR6.1.2.7.3.1	The default columns to be displayed on the travel time summary page shall be DMS Description/Location, Current Message, and Queued Messages.	Travel Routes	View Travel Time Summary	Prototype only
SR6.1.2.7.3.2	The system shall not allow the Description / Location column to be hidden.	Travel Routes	View Travel Time Summary	Prototype only

Tag	Requirement	Feature	Use Cases	Other Design Elements
SR6.1.2.7.4	The system shall allow the user to sort the travel time summary page by any one of the following columns: Description, Location, Current Message, Beacon Status, Queued Messages, Flag that indicates if the DMS overrides the system travel time schedule, DMS Status, Route, Direction, County, Owning Organization, Maintaining Organization, and the Show On Map column.	Travel Routes	Sort Travel Time Summary	Prototype only
SR6.1.2.7.5	The system shall allow the user to filter the travel time summary page by the following columns: Current Message, Beacon Status, Queued Messages, Flag that indicates if the DMS overrides the system travel time schedule, DMS Status, Route, Direction, County, Owning Organization, Maintaining Organization, and the Show On Map column.	Travel Routes	Filter Travel Time Summary	GUIDMSTravTimeViewDynListClasses CD, prototype
SR6.1.2.7.5.1	The system shall allow the user to filter the travel time summary page to view all DMSs that are configured to display at least one travel time message and are currently blank.	Travel Routes	Filter Travel Time Summary	GUIDMSTravTimeViewDynListClasses CD, prototype
SR6.1.2.7.5.2	The system shall allow the user to filter the travel time summary page to view all DMSs that are configured to display at least one travel time message and are currently displaying a message for a traffic event.	Travel Routes	Filter Travel Time Summary	GUIDMSTravTimeViewDynListClasses CD, prototype

Tag	Requirement	Feature	Use Cases	Other Design Elements
SR6.1.2.7.5.3	The system shall allow the user to filter the travel time summary page to view all DMSs that are configured to display at least one travel time message and have one or more messages queued for display.	Travel Routes	Filter Travel Time Summary	GUIDMSTravTimeViewDynListClasses CD, prototype
SR6.1.2.7.5.4	The system shall indicate any filters currently in use on the travel time summary page.	Travel Routes	Filter Travel Time Summary	Prototype only
SR6.1.2.7.5.5	The system shall allow the user to combine two or more filters on the travel time summary page.	Travel Routes	Filter Travel Time Summary	Prototype only
SR6.1.2.7.5.6	The system shall allow the user to remove an individual filter from the travel time summary page.	Travel Routes	Filter Travel Time Summary	Prototype only
SR6.1.2.7.5.7	The system shall allow the user to remove all filters from the travel time summary page to view all DMSs configured to display at least one travel time message.	Travel Routes	Filter Travel Time Summary	Prototype only
SR6.1.7	The system shall allow a device to be activated even if it is not used for an event (e.g., to display travel time).		Perform DMS Traveler Information Message Activation / Deactivation	Chart2DMSImpl.checkTravInfoMsgs SD Chart2DMSImpl.setActiveTravInfoMessage SD
SR6.1.7.1	The system shall activate a pre-configured traveler information message on a DMS according to the rules as specified in SR6.1.7.7.	DMS, Travel Routes	Activate DMS Traveler Information Message	Chart2DMSImpl.checkTravInfoMsgs SD Chart2DMSImpl.setActiveTravInfoMessage SD
SR6.1.7.2	The system shall deactivate a traveler information message that is currently active on a DMS if it is found to no longer be the active message for the DMS according to the rules as specified in SR6.1.7.7.	DMS, Travel Routes	Deactivate DMS Traveler Information Message	Chart2DMSImpl.checkTravInfoMsgs SD Chart2DMSImpl.setActiveTravInfoMessage SD
SR6.1.7.5	The system shall log a message in the operations log when the system deactivates a traveler information message.	DMS, Travel Routes	Deactivate DMS Traveler Information Message	Chart2DMSImpl.setActiveTravInfoMessage SD

Tag	Requirement	Feature	Use Cases	Other Design Elements
SR6.1.7.7	The system shall periodically determine which traveler information message (if any) is to be active for a DMS.	DMS, Travel Routes	Perform DMS Traveler Information Message Activation / Deactivation	Chart2DMSImpl.checkTravInfoMsgs SD
SR6.1.7.7.1	A message containing a toll rate shall be eligible to be active if it is enabled and is date-eligible for the current day (as defined below).	Travel Routes	Determine Active Traveler Information Message for DMS	Chart2DMSImpl.determineActiveTravInfoMessage SD
SR6.1.7.7.2	A travel time (only) message shall be eligible to be active if it is enabled and travel time messages are enabled (system-wide) for the DMS's owning organization and the time of day matches the DMS's travel time schedule and the message is date-eligible for the current day (as defined below).	Travel Routes	Determine Active Traveler Information Message for DMS	Chart2DMSImpl.determineActiveTravInfoMessage SD
SR6.1.7.7.3	A traveler information message shall be date-eligible on the current day if the Any Days Of Week setting is specified and one of the following is true: Holidays Only is specified and today is a holiday; or Non-Holidays is specified and today is not a holiday.	Travel Routes	Determine Active Traveler Information Message for DMS	Chart2DMSImpl.determineActiveTravInfoMessage SD
SR6.1.7.7.4	A traveler information message shall be date-eligible on the current day if Days Of Week are specified and today is one of the specified days of the week and one of the following is true: neither Holidays Only nor Non-Holidays is specified; or Holidays Only is specified and today is a holiday; or Non-Holidays is specified and today is not a holiday.	Travel Routes	Determine Active Traveler Information Message for DMS	Chart2DMSImpl.determineActiveTravInfoMessage SD

Tag	Requirement	Feature	Use Cases	Other Design Elements
SR6.1.7.7.8	When more than one traveler information message for a DMS is eligible to be active, the message with the highest precedence (as set via the message order) shall be the active message.	Travel Routes	Determine Active Traveler Information Message for DMS	Chart2DMSImpl.determineActiveTravInfoMessage SD
SR6.1.7.8	[DELETED - COVERED BY SR6.1.7.7.2] Was: The system shall deactivate a traveler information message according to a DMS's travel time schedule, if the message contains no toll rate tags and is currently active.	DMS, Travel Routes	N/A - Deleted	N/A - Deleted
SR6.1.8	The system shall allow a user with the configure system right to manage a list of holidays for use by traveler information messages. (The system will use this list when determining which traveler information message is active for a DMS, if any. See SR6.1.7.7)	Travel Routes	View Holidays Add Holiday Edit Holiday Remove Holiday	GUIServletDMSClasses CD, DMSTravInfoMsgHolidayReqHdlr.(getTravInfoMsgHolidaysForm, addTravInfoMsgHoliday, editTravInfoMsgHoliday, and removeTravInfoMsgHoliday SDs); prototype
SR6.1.8.1	The system shall allow a user with the configure system right to view the current holidays defined in the system.	Travel Routes	View Holidays	DMSTravInfoMsgHolidayReqHdlr.getTravInfoMsgHolidaysForm SD, prototype
SR6.1.8.1.1	The system shall display the holiday description and the holiday date for each holiday that is defined in the system.	Travel Routes	View Holidays	DMSTravInfoMsgHolidayReqHdlr.getTravInfoMsgHolidaysForm SD, prototype
SR6.1.8.2	The system shall allow a user with the configure system right to add a holiday to the system.	Travel Routes	Add Holiday	DMSTravInfoMsgHolidayReqHdlr.addTravInfoMsgHoliday SD, prototype
SR6.1.8.3	The system shall allow a user with the configure system right to edit a holiday that has been defined in the system.	Travel Routes	Edit Holiday	DMSTravInfoMsgHolidayReqHdlr.editTravInfoMsgHoliday SD, prototype
SR6.1.8.4	The system shall allow a user with the configure system right to remove a holiday from the system.	Travel Routes	Remove Holiday	DMSTravInfoMsgHolidayReqHdlr.removeTravInfoMsgHoliday SD, prototype

Tag	Requirement	Feature	Use Cases	Other Design Elements
SR6.1.8.4.1	The system shall confirm the user's intention to delete a holiday before removing it from the system.	Travel Routes	Remove Holiday	prototype only
SR6.1.8.5	The system shall allow only one holiday to be defined per date.	Travel Routes	Add Holiday Edit Holiday	Chart2DMSFactoryImpl.addTravInfoMsgHoliday
SR6.1.8.5.1	If a holiday is added or edited to have the same date as a holiday that already exists, the system shall replace the existing holiday for that date with the new or edited holiday.	Travel Routes	Add Holiday Edit Holiday	Chart2DMSFactoryImpl.addTravInfoMsgHoliday
SR6.1.9	The system shall allow a user with the Enable/Disable Travel Times System-Wide right to enable or disable travel times system-wide based on a DMS's owning organization for the organizations for which they have been granted this right.	Travel Routes	Enable / Disable Travel Time Messages System-Wide Per Organization	OrganizationImpl.setConfig SD, OrganizationReqHdlr.getPerOrgTravelTimeMsgSettingsForm SD, OrganizationReqHdlr.setPerOrgTravelTimeMsgSettings SD, prototype
SR6.1.10	The system shall allow a user with the configure system right to manage the system-wide travel time display schedule to specify the default times of day travel time messages can be displayed on DMSs. (DMSs can override this system-wide schedule.)	Travel Routes	Set Default Travel Time Message Time of Day Schedule	N/A - No code changes for R12.
SR10	SYSTEM INTEGRATION		N/A	N/A (Heading)
SR10.8	The system shall integrate event data from external systems together with internally created CHART events.		N/A	
SR10.8.8	The system shall allow a suitably privileged user to manage zero or more rules for determining which external events the system is to import into CHART (and by implication, which external events to exclude from CHART).		N/A	

Tag	Requirement	Feature	Use Cases	Other Design Elements
SR10.8.8.1	The system shall allow a suitably privileged user to create and store zero or more external event import rules.		N/A	
SR10.8.8.1.3	The system shall allow a suitably privileged user to define criteria all of which must be satisfied for the external event import rule to be satisfied.		N/A	
SR10.8.8.1.3.7	The system shall support the use of one or more External Agency names as an external event rule criterion.	Import	Configure External Event Import Rules, Import RITIS Event Data	
SR10.11	The system shall integrate with INRIX for the purpose of requesting travel times for routes configured within CHART.	Travel Routes	Import Travel Times From INRIX	CHART ATMS Server Deployment Diagram (No design changes needed)
SR10.11.1	The system shall pull data from the INRIX system web service at a configurable periodic interval.	Travel Routes	Import Travel Times From INRIX	CHART ATMS Server Deployment Diagram (No design changes needed)
SR10.11.1.3	The system shall raise an External Connection Alert if the data retrieved from the INRIX system web service does not contain one or more INRIX links that have been associated with CHART travel routes.	Travel Routes	Import Travel Times From INRIX	CHART ATMS Server Deployment Diagram (No design changes needed)
SR10.17	The system shall integrate with the MDTA Travel Time System for the purpose of requesting travel times for routes configured within CHART.	Travel Routes	Import Travel Times From MDTA, Archive MDTA Travel Times, Import MDTA Link Definitions	CHART ATMS Server Deployment Diagram (No design changes needed)
SR10.17.1	The system shall pull data from the MDTA Travel Time System at a configurable periodic interval.	Travel Routes	Import Travel Times From MDTA	CHART ATMS Server Deployment Diagram (No design changes needed)

Tag	Requirement	Feature	Use Cases	Other Design Elements
SR10.17.1.1	The system shall raise an External Connection Alert if the data cannot be successfully retrieved from the MDTA Travel Time System for a configurable period of time.	Travel Routes	Import Travel Times From MDTA	CHART ATMS Server Deployment Diagram (No design changes needed)
SR10.17.1.2	The system shall raise an External Connection Alert if the data retrieved from the MDTA Travel Time System does not conform to the documented format.	Travel Routes	Import Travel Times From MDTA	CHART ATMS Server Deployment Diagram (No design changes needed)
SR10.17.1.3	The system shall raise an External Connection Alert if the data retrieved from the MDTA Travel Time System does not contain one or more MDTA links that have been associated with CHART travel routes.	Travel Routes	Import Travel Times From MDTA	CHART ATMS Server Deployment Diagram (No design changes needed)
SR10.17.2	The system shall archive MDTA Travel Time data used to create travel time messages.	Travel Routes	Archive MDTA Travel Times	CHART ATMS Server Deployment Diagram (No design changes needed)
SR10.17.2.1	The system shall archive all raw data received from the MDTA Travel Time System for a configurable period of time.	Travel Routes	Archive MDTA Travel Times	CHART ATMS Server Deployment Diagram (No design changes needed)
SR10.17.2.2	The system shall archive, for a configurable period of time, all MDTA Travel Time data for each configured travel route sufficient to determine the travel time messages that were displayed at a particular time for that travel route.	Travel Routes	Archive MDTA Travel Times	CHART ATMS Server Deployment Diagram (No design changes needed)
SR10.17.3	The system shall allow an administrator to import link definitions from flat files provided by MDTA via an offline process.	Travel Routes	Import MDTA Link Definitions	CHART ATMS Server Deployment Diagram (No design changes needed)

Tag	Requirement	Feature	Use Cases	Other Design Elements
SR10.17.3.1	Each import of MDTA link definitions from the flat files shall only add new link definitions to the system or update existing (if the link ID matches a previously imported MDTA link).	Travel Routes	Import MDTA Link Definitions	CHART ATMS Server Deployment Diagram (No design changes needed)
SR10.17.3.1.1	The MDTA link definition import process shall not remove any existing link definitions (after the import runs the system will have at least all links it had before the import began).	Travel Routes	Import MDTA Link Definitions	CHART ATMS Server Deployment Diagram (No design changes needed)
SR10.17.3.2	The system shall import only those MDTA link definitions whose start and end points lie within a configurable bounding rectangle.	Travel Routes	Import MDTA Link Definitions	CHART ATMS Server Deployment Diagram (No design changes needed)

8 Use Case Diagrams

The use case diagrams depict new functionality for CHART ATMS R12 and also identify existing features that will be enhanced. The use case diagrams exist in the Enterprise Architect design tool in the chartdesign project, under the CHART-ATMS-R12 folder.

8.1 DMS Management

8.1.1 Activate / Deactivate Traveler Information Messages

This diagram shows use cases related to the system's activation and deactivation of traveler information messages for a DMS.

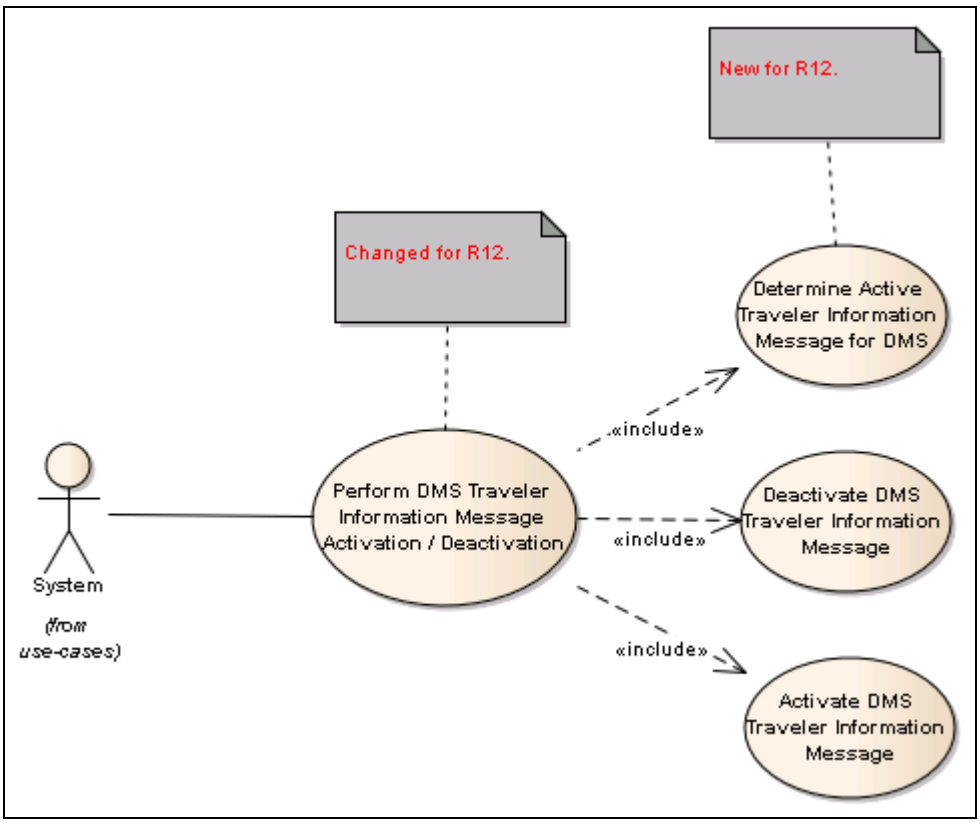


Figure 8-1 Activate / Deactivate Traveler Information Messages

8.1.1.1 Activate DMS Traveler Information Message

When the system activates a traveler information message on a DMS, it uses the message template and the data from the travel routes to construct a DMS message and places that message on the DMS arbitration queue. The system uses the arbitration queue priority as configured for the DMS based on whether or not the message is a toll rate message or travel time message (a mixed message is treated as a toll rate message). Traveler information messages can be combined with other messages depending on the message combination rules specified in the system profile. Only one traveler information message

can be active at a given time on a DMS. Once a message is active, the system will keep the data in the message updated as provided by the travel routes configured for the message.

This use case does not change for R12; once the system determines which message is to be active, the processing to actually activate that message and keep the message up to date does not change.

8.1.1.2 Deactivate DMS Traveler Information Message

When the system deactivates a DMS traveler information message, it removes the message from the DMS arbitration queue. The system will log a message in the operations log when it deactivates a traveler information message.

This use case does not change for R12.

8.1.1.3 Determine Active Traveler Information Message for DMS

The system will determine which traveler information message for a DMS is to be the active message (if any) by evaluating all enabled traveler information messages for the DMS and finding the highest priority message that meets all of the criteria that apply, as follows: If the message is not a toll rate message (doesn't have any toll rate tags), travel times for the DMS's owning organization must be enabled system-wide. If the message has a holiday setting (other than not-set), then the current day must either be a holiday or not be a holiday, depending on whether the setting indicates holiday or non-holiday, using the system-wide list of holidays. If the holiday setting is not used or indicates it only applies to a specific day of week, then the current day of week must match one of the specified days of week for the message. Finally, if the message is not a toll rate message, the current time of day must fall within the travel time time of day schedule specified for the DMS (which could be the default system-wide travel time schedule).

8.1.1.4 Perform DMS Traveler Information Message Activation / Deactivation

Periodically, and when a user action changes the enabled/disabled state or configuration of traveler information messages for a DMS, the system will perform processing to set the active traveler information message for the DMS. This involves determining which message should be active (if any) and then performing message deactivation (if needed) and message activation (if needed). In the case where the system determines the message that should be active is already active, no action is performed.

8.1.2 Import Travel Times

This diagram contains use cases related to importing Travel Times from INRIX and MDTA.

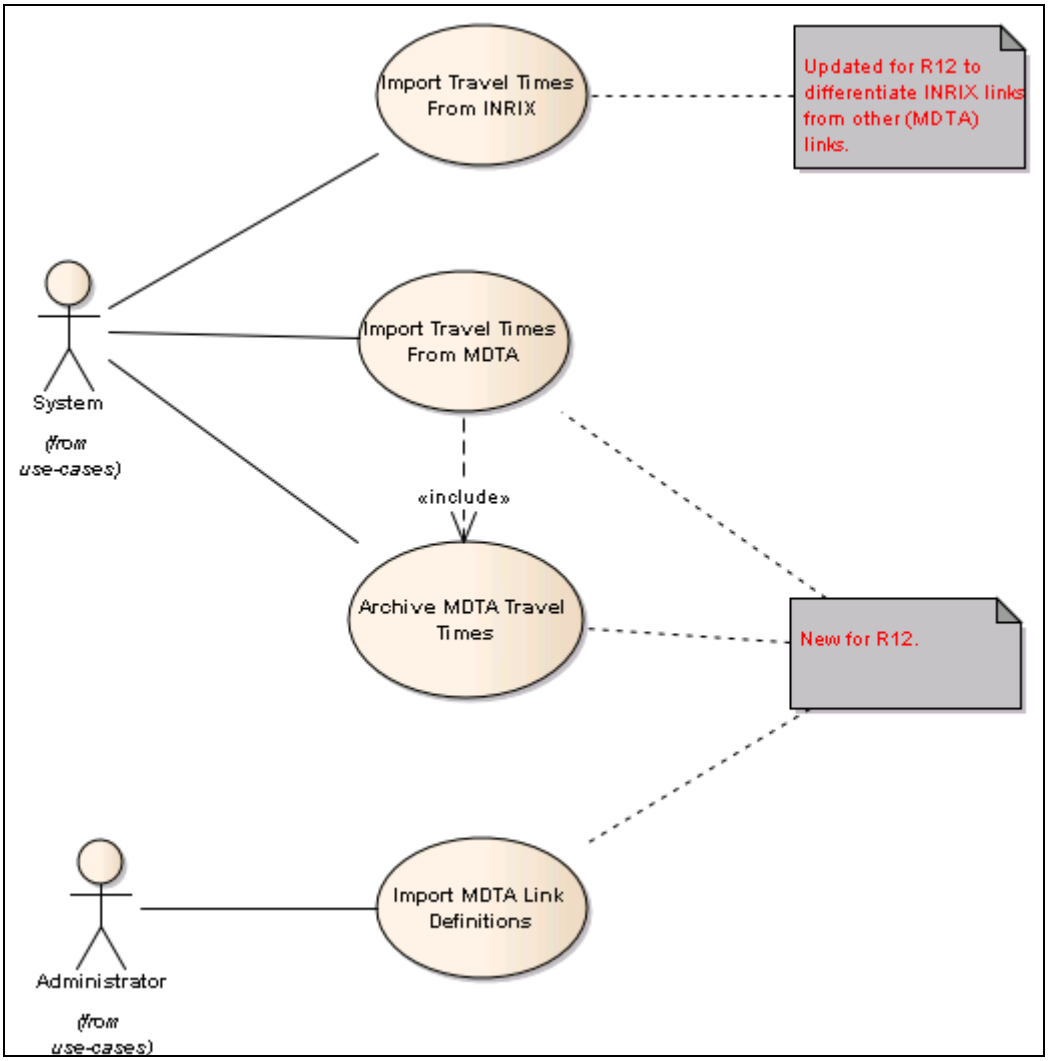


Figure 8-2. Import Travel Times

8.1.2.1 Archive MDTA Travel Times

The system will archive all raw MDTA travel time data used to create travel time messages for a configurable period of time. Data will be archived for each travel route, to make it possible to determine the travel time messages that were displayed at a particular time for that travel route.

8.1.2.2 Import MDTA Link Definitions

An administrator will be able to import MDTA link definitions using an offline process. The import process will add or update link definitions in CHART, but will not cause existing link definitions to be removed from CHART. A link must have starting and ending points within a configurable bounding rectangle to be imported.

8.1.2.3 Import Travel Times From INRIX

The system will import link travel time data from INRIX at a configurable periodic interval. If the imported data does not contain any INRIX links associated with CHART travel routes, the system will raise an External Connection Alert.

8.1.2.4 Import Travel Times From MDTA

The system will import link travel time data from the MDTA Travel Time System at a configurable periodic interval. The system will raise an External Connection alert if data cannot be retrieved for a configurable period of time, the data does not conform to the documented format, or the imported data does not contain any MDTA links associated with CHART travel routes.

8.1.3 Manage DMS Traveler Information Messages

This diagram shows use cases related to the management of traveler information messages for a DMS.

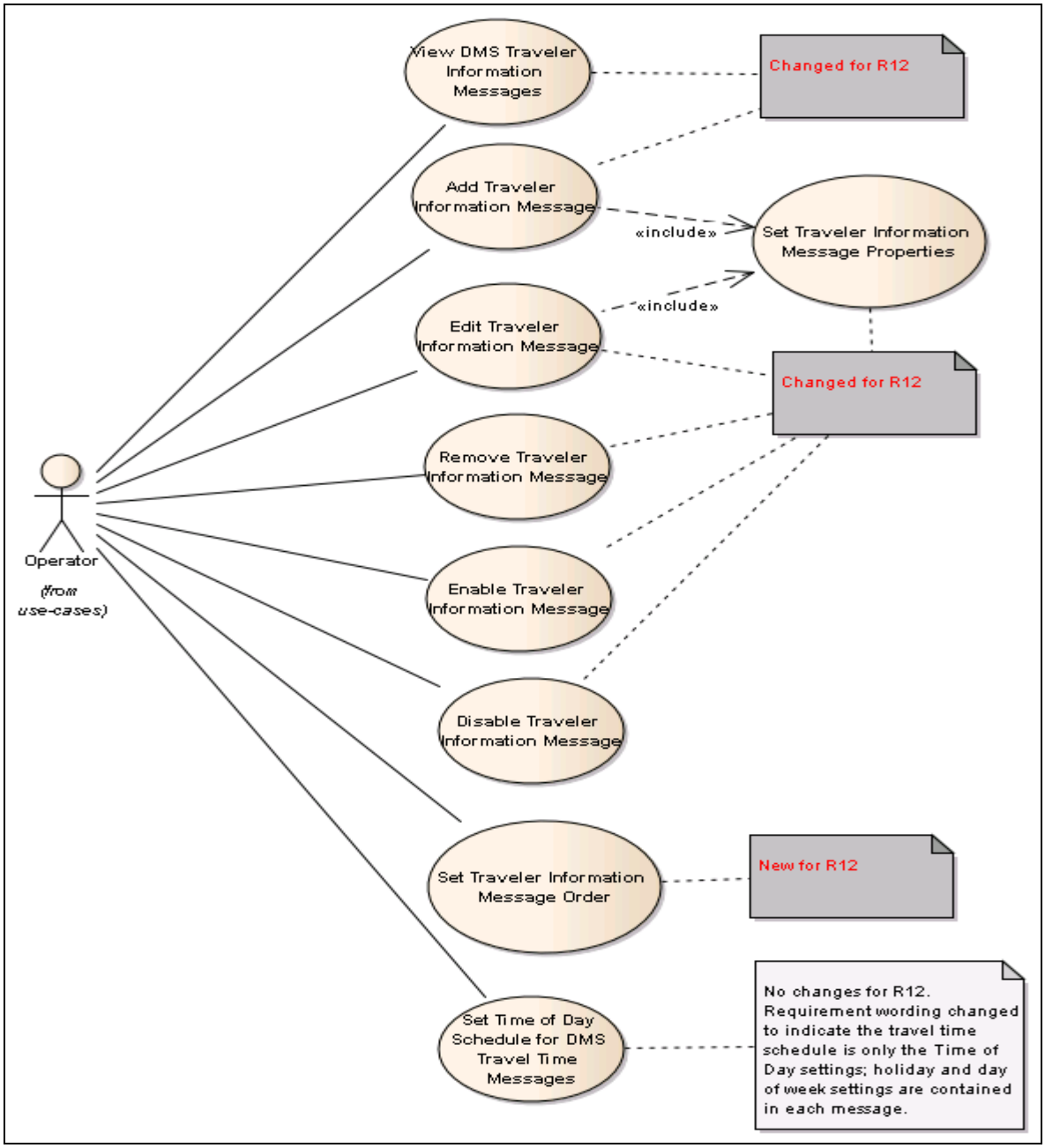


Figure 8-3. Manage DMS Traveler Information Messages

8.1.3.1 Add Traveler Information Message

A user with the Configure DMS right for the DMS's owning organization can add a new traveler information message for the DMS. The user can specify the properties for the message as specified in Set Traveler Information Message Properties. The system will add the message in the Disabled state and will log a message in the operations log to record this action.

8.1.3.2 Disable Traveler Information Message

A user with the Change DMS Traveler Info Message State right can disable a traveler information message for a DMS if that message is currently enabled. When a message is disabled the system will re-evaluate all of the messages to determine which message is to be the active message (if any) and deactivate/activate a message as needed. The system will log a message in the operations log to record the fact that the user disabled the message.

8.1.3.3 Edit Traveler Information Message

A user with the Configure DMS right for the DMS's owning organization can edit an existing traveler information message. The user can change the properties as specified in Set Traveler Information Message Properties. If the message being edited is an enabled message, the system will re-evaluate the messages to determine which message should be active, and then deactivate / activate a message as needed. The system will log a message in the operations log to record the fact that the message was edited.

8.1.3.4 Enable Traveler Information Message

A user with the Change DMS Traveler Info Message State right can enable a traveler information message for a DMS if that message is currently disabled. The system will allow multiple messages to be enabled for a DMS, and when a message is enabled the system will re-evaluate all of the messages to determine which message is to be the active message (if any) and deactivate/activate a message as needed. The system will log a message in the operations log to record the fact that the user enabled the message.

8.1.3.5 Remove Traveler Information Message

A user with the Configure DMS right for the DMS's owning organization can remove a traveler information message from a DMS if that message is not currently enabled. The system will show a confirmation dialog to confirm the user's intent. The system will log a message in the operations log to indicate the user removed the message.

8.1.3.6 Set Time of Day Schedule for DMS Travel Time Messages

A user with the Configure DMS right for the DMS's owning organization can set the time of day travel time display schedule for a DMS. This schedule can be set to use the system-wide default schedule or can be set to override the system default. If overridden, the schedule can indicate that travel time messages are allowed to be displayed at any time of day (24 hours) or it can specify one or more time periods during the day when travel time messages can be displayed. This use case is not changed for R12 except for the wording to make it clear the schedule is the time of day schedule. The day of week and holiday settings also play a part in determining whether or not a travel time message will be displayed.

8.1.3.7 Set Traveler Information Message Order

A user with the Configure DMS right for the DMS's owning organization can set the order of precedence of the traveler information messages for the DMS. The order of precedence determines which message will become active in the case where multiple enabled messages are eligible to be active on the given day. For example, if two enabled messages are set to apply to Monday and today is Monday, the one with the highest precedence will become the active message. The system will log a message in the operations log to record the fact that the message order has been changed. After the order is changed, the system must re-evaluate the messages to determine if a different message should become the active message, and if so, deactivate/activate a message as needed.

8.1.3.8 Set Traveler Information Message Properties

When adding or editing a traveler information message, the user must choose a message template and one or more routes to be used in the template (depending on the number of routes included in the template). The user may choose to use automatic row positioning for the message, meaning the system will try to automatically position the rows of the message depending on the number of rows in the message and the number of rows on the sign. The user must choose the holiday setting for the message, or indicate that the holiday setting is not used (this is the default). The holiday settings can be used to indicate the message only applies to holidays, only applies to holidays that occur on specific days of the week, only applies to non-holidays, or only applies to non-holidays on specific days of the week. If the user indicates holiday settings are not used or chooses a holiday setting that applies to specific days of the week, the user must choose the days of week the message applies to (the default is all days of the week).

8.1.3.9 View DMS Traveler Information Messages

A user can view the traveler information messages configured for a DMS. For each message, the following information shall be shown: Status (enabled/disabled, and if enabled whether or not it is active), Day of Week and Holiday Settings, the name of the message template being used, the travel routes included in the message, and a true display image that approximates what the message will look like when displayed on the DMS.

8.1.4 Travel Time / Toll Rate Settings

This diagram shows the uses related to managing settings related to travel time and toll rate messages.

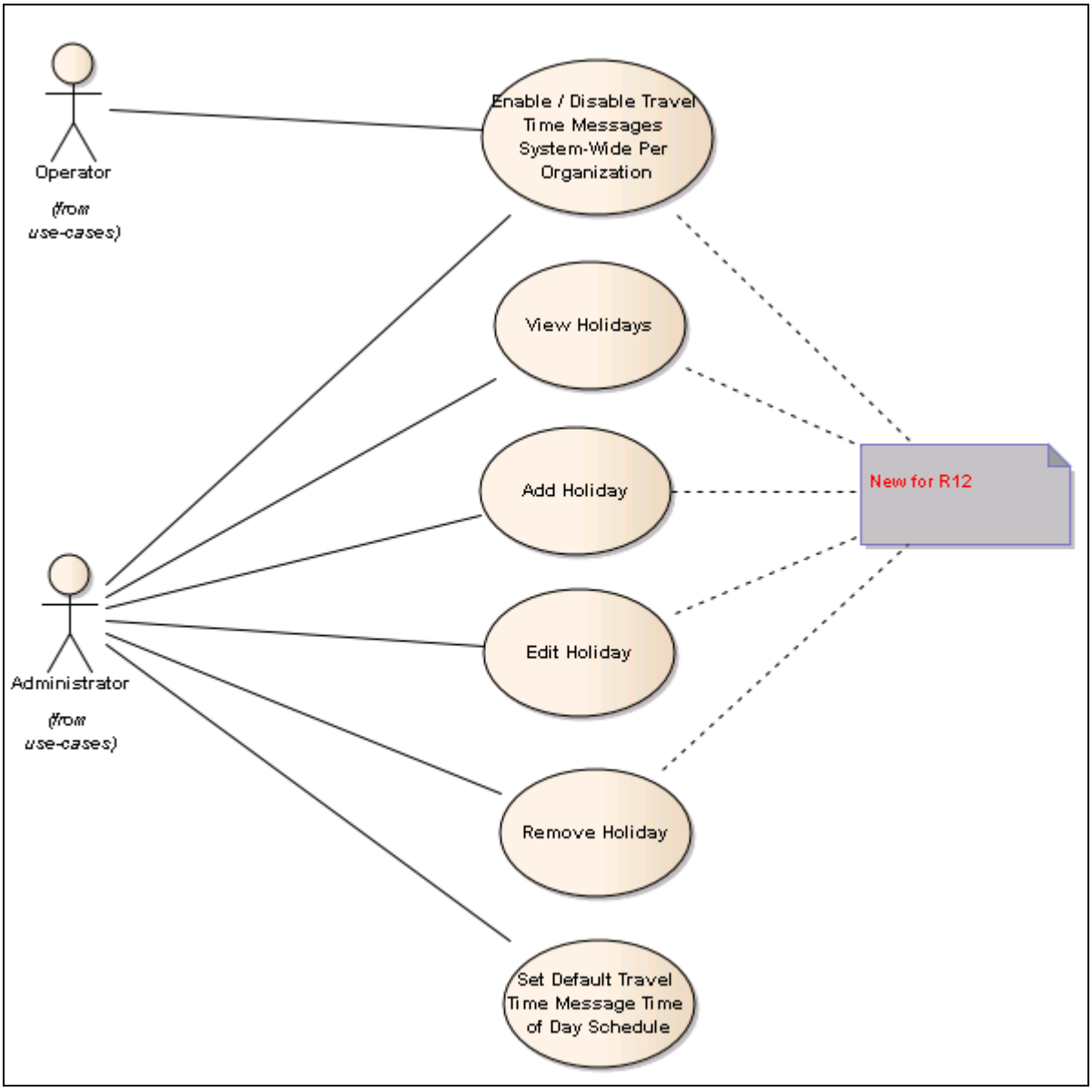


Figure 8-4. Travel Time / Toll Rate Settings

8.1.4.1 Add Holiday

An administrator with the Configure System right can add a holiday to the list of holidays available for use by traveler information messages. If the user enters a holiday date that is already defined, the newly added holiday will replace the existing holiday. Each holiday has a name and date.

8.1.4.2 Edit Holiday

An administrator with the Configure System right can edit a holiday that has been previously added. The user can change the holiday name and/or date. If the user changes the holiday to have the same date as another holiday, the edited holiday will replace that holiday.

8.1.4.3 Enable / Disable Travel Time Messages System-Wide Per Organization

A user with the right to enable/disable travel time messages system wide can enable or disable travel time messages for all DMSs based on their owning organization, but only for owning organizations for which the user has been granted this right.

8.1.4.4 Remove Holiday

An administrator with the Configure System right can remove a holiday from the list of holidays used by traveler information messages. The system will confirm the user's intent prior to removing the holiday to help prevent holidays from being removed unintentionally.

8.1.4.5 Set Default Travel Time Message Time of Day Schedule

An administrator with the Configure System right can set the default travel time message time of day schedule. The schedule can specify that travel time messages can be active 24 hours a day or can specify specific time periods during the day when travel time messages can be active. This default schedule is used for any DMS that is set to use the system's travel time schedule.

8.1.4.6 View Holidays

An administrator with the Configure System right can view the list of holidays that have been configured for use by traveler information messages.

8.1.5 Travel Time Summary

This diagram contains use cases related to the Travel Time Summary page, which shows the DMSs with travel time messages configured. Users will be able to view, sort, and filter the list of DMSs shown.

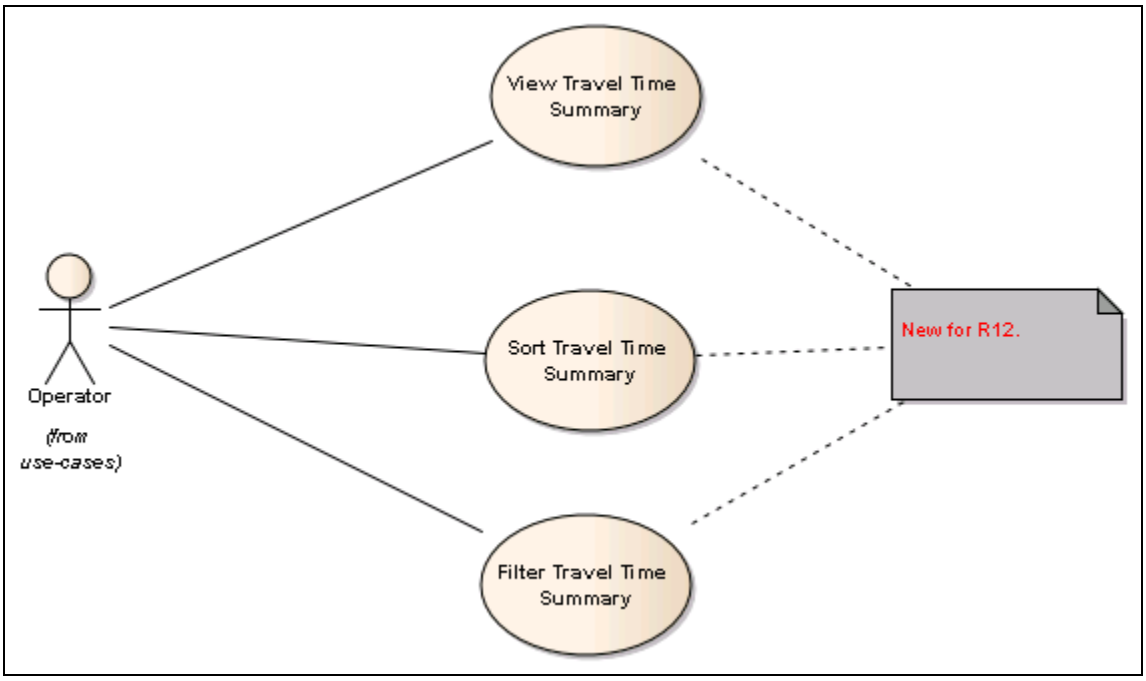


Figure 8-5. Travel Time Summary

8.1.5.1 Filter Travel Time Summary

The user can filter the Travel Time Summary by current message, beacon status, queued messages, flag that indicates if the DMS overrides the system travel time schedule, DMS comm mode status, route, direction, county, owning organization, maintaining organization, and the presence of the Show On Map link. Filtering on the current message will include the options to view travel time DMSs that are blank (not showing a message) or those that are displaying a message for a traffic event. Filtering on the queued messages will include those that have one or more messages queued, or ones that do not have and messages queued. The current filters will be described on the page. The user will be able to combine multiple filters to perform AND filtering, remove an individual filter, or remove all filters in use.

8.1.5.2 Sort Travel Time Summary

The user can sort the Travel Time Summary by: description, location description, current message, beacon status, queued messages, flag that indicates if the DMS overrides the system travel time schedule, DMS comm mode status, route, direction, county, owning organization, maintaining organization, and the presence of the "Show On Map" link.

8.1.5.3 View Travel Time Summary

A user can view the Travel Time Summary, which displays information for each DMS for which travel time messages have been configured (i.e., even if the travel time messages are all disabled). The summary page will display the DMS description, location description, current message, beacon status, queued messages, flag that indicates if the DMS overrides the system travel time schedule, DMS comm mode status, route, direction, county, owning organization, and maintaining organization. A "Show On Map" link will be displayed if the DMS has a lat/long specified, which (if clicked) will display the DMS on the Home Page map. By default the Description/Location, Current Message, and Queued Messages columns will be displayed, but the user will be able to choose which of the columns to display (with the exception of the Description/Location column, which cannot be hidden).

8.2 CAD 911 Integration

8.2.1 Linked Event Related Configuration

This diagram shows the used cases related to configuration for linked event settings.

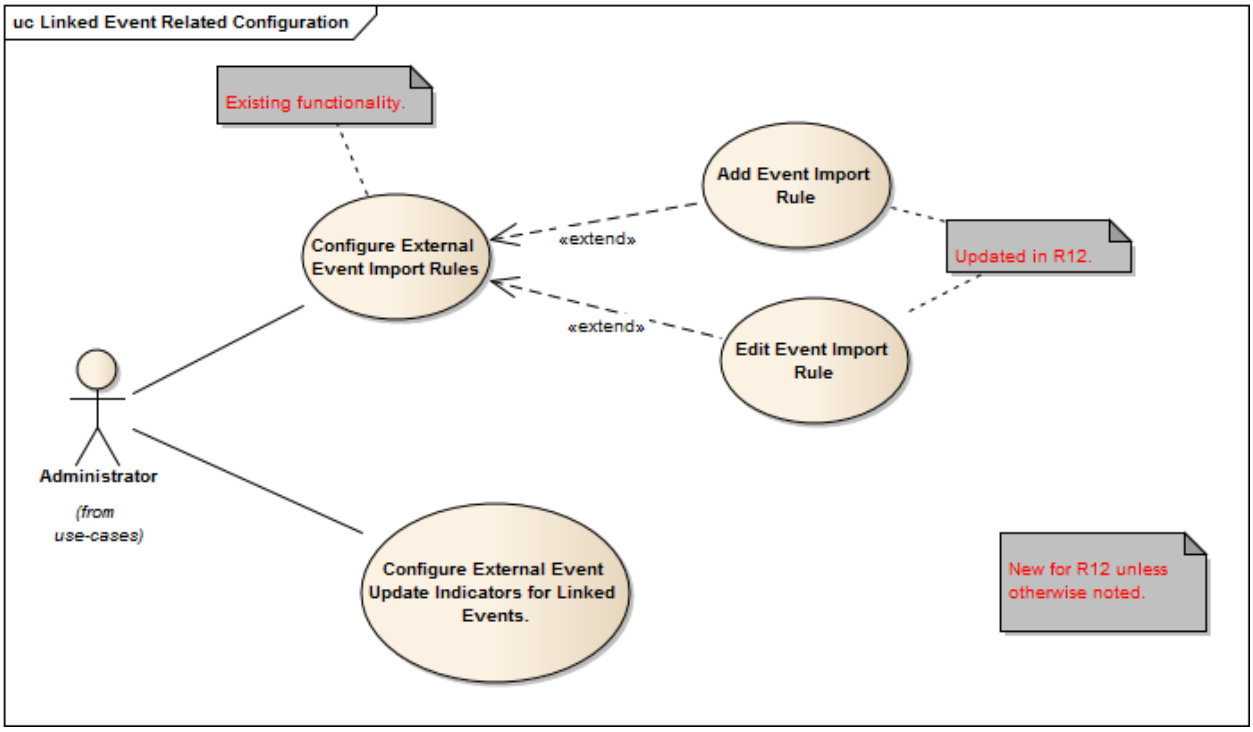


Figure 8-6. Linked Event Related Configuration

8.2.1.1 Add Event Import Rule

A suitably privileged user can add an event import rule to the system. Each rule contains criteria that when met by an external event will cause that external event to be imported into the CHART system. Rules can also have actions that are taken if the criteria is met, including whether or not an External Event Alert should be sent and to which operations center, whether or not a notification should be sent and to

which notification group, and whether or not the event's interesting flag should be set upon import. For R12 agency name has been added as a new filter criteria.

8.2.1.2 Configure External Event Import Rules

A user with sufficient rights will be able to add, edit, and remove rules for importing external events. These rules will contain criteria that an external event must meet to be imported into the CHART system. Each rule will also specify whether the event is to be marked "interesting", should generate an External Event Alert, or should cause a notification message to be sent when the event is imported.

8.2.1.3 Configure External Event Update Indicators for Linked Events

An administrator may enable or disable the External Event Update Indicator functionality for Linked Events. Each field group for a Linked Event (as of R12: General Info, Location, Incident Info, Lane Config / Status) can have its indicator functionality enabled or disabled on a system wide basis. When the functionality is enabled, an indicator will be displayed for the Linked CHART Event when its corresponding external event's data has changed.

8.2.1.4 Edit Event Import Rule

A suitably privileged user can edit an existing event import rule. This includes changing any of the filter criteria or actions. For R12 agency name has been added as a new filtering criteria.

8.2.2 External Interfaces

This diagram depicts the uses cases related to the External Interface (Traffic Event Import via the RITIS service).

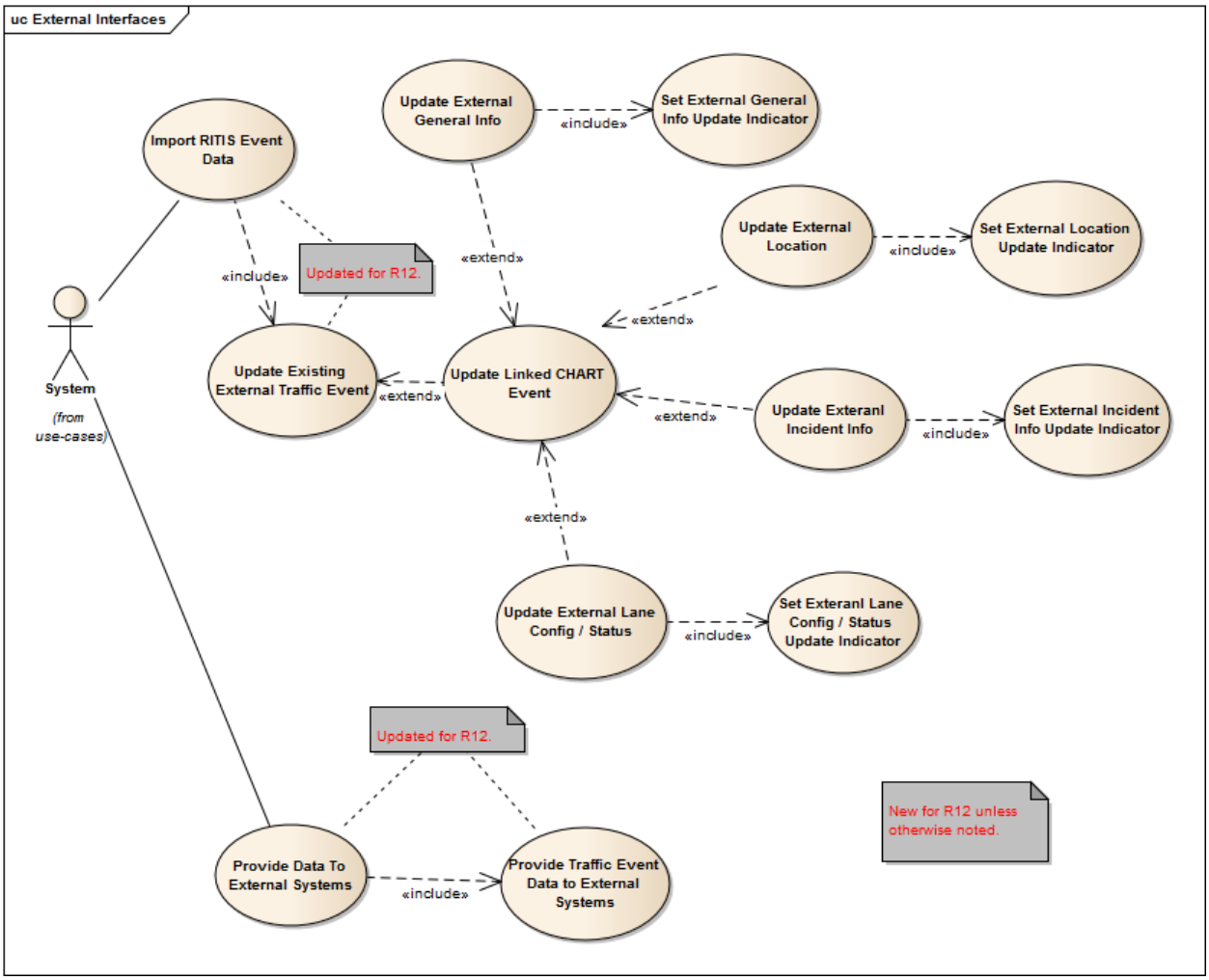


Figure 8-7. External Interfaces

8.2.2.1 Import RITIS Event Data

The system shall import event data from RITIS. The data is provided by RITIS in the SAE ATIS J2354 standard. For R12 this functionality is being enhanced to allow a new Agency Name filter criteria for Event Import Rules.

8.2.2.2 Provide DataTo External Systems

The system shall provide access to external systems via a web service to allow them to receive data that the CHART system makes available to third parties.

8.2.2.3 Provide Traffic Event Data to External Systems

The system shall allow external systems to receive traffic event data from CHART. For R12 new fields will be available for export including: a Linked CHART Events External Event Identifier (System Name, Agency, and External ID), Web Alert Text and Audio Text, and Event Geo Scope.

8.2.2.4 Set Exteranl Lane Config / Status Update Indicator

The External Lane Config / Status Update Indicator for a Linked CHART Event will be set (true) when the Event receives updated external event data but only if the system is configured to track changes to the External Lane Config / Status for Linked CHART Events.

8.2.2.5 Set External General Info Update Indicator

The External General Info Update Indicator for a Linked CHART Event will be set (true) when the Event receives updated external event data.but only if the system is configured to track changes to the External General Event Info for Linked Events

8.2.2.6 Set External Incident Info Update Indicator

The External Incident Information Update Indicator for a Linked CHART Event will be set (true) when the Event receives updated external event data but only if the system is configured to track changes to the External Incident Information for Linked CHART Events.

8.2.2.7 Set External Location Update Indicator

The External Event Location Update Indicator for a Linked CHART Event will be set (true) when the Event receives updated external event data but only if the system is configured to track changes to the External Event Location for Linked CHART Events.

8.2.2.8 Update Existing External Traffic Event

The system shall update any existing CHART External Events (I.E. previously imported) with new information provided about that event from the external source. For R12 when an External Event is being updated from the external source it will also provide updated information to its Linked CHART Event if it has one.

8.2.2.9 Update Exteranl Incident Info

A Linked CHART Event will receive updated Incident Information from its linked External Event. The Linked CHART Event's Location will be replaced with the update external event data if an operator has not overridden the Linked CHART Event's Incident Information (thus blocking it from being updated by the External Event). The External Incident Information Update Indicator will be set (true) whether data is being overridden in Linked CHART Event or not but only if the system is configured to track changes to the External Incident Information for Linked CHART Events.

8.2.2.10 Update External General Info

A Linked CHART Event will receive updated General Event Information from its linked External Event. The Linked CHART Event's General Info will be replaced with the update external event data if an operator has not overridden the Linked CHART Event's General Information (thus blocking it from being updated by the External Event). The External General Info Update Indicator will be set (true) whether data is being overridden in the Linked CHART Event or not but only if the system is configured to track changes to the External General Event Info for Linked Events.

8.2.2.11 Update External Lane Config / Status

A Linked CHART Event will receive updated Lane Config / Status from its linked External Event. The Linked CHART Event's Lane Config / Status will be replaced with the update external event data if an operator has not overridden the Linked CHART Event's Lane Config / Status (thus blocking it from being updated by the External Event). The External Lane Config / Status Update Indicator will be set (true) whether data is being overridden in Linked CHART Event or not but only if the system is configured to track changes to the External Lane Config / Status for Linked CHART Events.

8.2.2.12 Update External Location

A Linked CHART Event will receive updated Event Location Information from its linked External Event. The Linked CHART Event's Location will be replaced with the update external event data if an operator has not overridden the Linked CHART Event's Location (thus blocking it from being updated by the External Event). The External Event Location Update Indicator will be set (true) whether data is being overridden in the Linked CHART Event or not but only if the system is configured to track changes to the External Event Location for Linked CHART Events.

8.2.2.13 Update Linked CHART Event

The system will update External Event Information in a Link CHART Event via its linked External Event.

8.2.3 Manage Linked CHART Events

This diagram shows the use cases related to managing the linked event data for a linked CHART event.

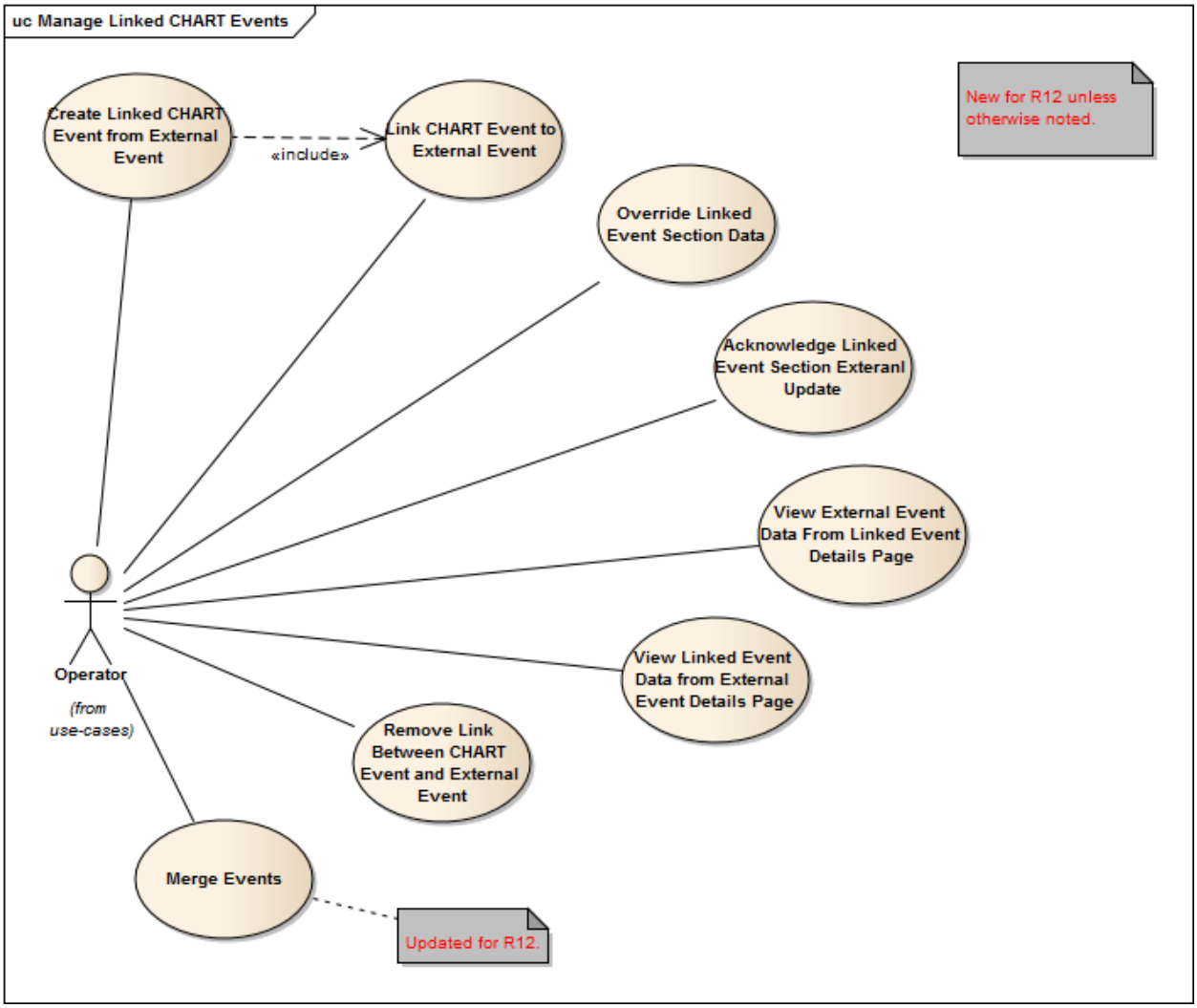


Figure 8-8. Manage Linked CHART Events

8.2.3.1 Acknowledge Linked Event Section External Update

An operator with Manage Event functional right can acknowledge the External Event Update Indicator for a linked event section. The indicator is displayed on a Linked CHART Event's details page. When the change is acknowledged, the indicator is reset until the next external change is detected. Alternatively, the indicator is reset when a user edits the linked event section data or when an operator chooses to revert to using the external events data after overriding the linked event section. For R12 there are 4 linked event sections available for override for a Linked CHART Event: General Event Info, Location, Incident Info, and Lane Config.

8.2.3.2 Create Linked CHART Event from External Event

An operator with Manage Event functional rights may link an existing CHART Event to and existing External Event of the same type. This linkage is made automatically when a user creates a Linked CHART Event from an existing External Event.

8.2.3.3 Link CHART Event to External Event

An operator with Manage Event functional right may create and linked CHART Event from an External Event's details page. The new event is created using the external data (including event type) with the controlling op center of the operator creating the event. The linkage between the External Event and CHART Event is made automatically.

8.2.3.4 Merge Events

An operator with Manage Event functional right can merge events. For R12 this feature is updatd to not allow a linked event to be the source or target of a merge.

8.2.3.5 Override Linked Event Section Data

An operator with Manage Event functional rights may override a linked event section of a Linked CHART Event to block external event data from populating (updating) that data. For R12 there are 4 linked event sections available for override for a Linked CHART Event: General Event Info, Location, Incident Info, and Lane Config. To override the data for a linked event section the user edits data in the specified section of the event (no actual change has to be made). The user may choose to begin using external data again for a linked event section that has previously been overridden by clicking on the "use external data' button specific to each linked event section.

8.2.3.6 Remove Link Between CHART Event and External Event

An operator with Manage Event functional right can remove the link between a CHART Event and an External Event. Once the link is removed, the CHART Event functions as a regular CHART Event and the External Event's information is no longer used to update the CHART Event.

8.2.3.7 View External Event Data From Linked Event Details Page

An operator will be able to view External Event data from a CHART Event's Details page if the CHART Event is linked to an External Event and the CHART Event is currently overriding that data with operator supplied values.

8.2.3.8 View Linked Event Data from External Event Details Page

An operator will be able to view Linked CHART Event data from an External Event's Details page if the External Event is linked to a CHART Event and the CHART Event is currently overriding that data with operator supplied values.

8.2.4 Linked Event Summary Information

This diagram shows the use cases related to viewing linked event summary information in the GUI.

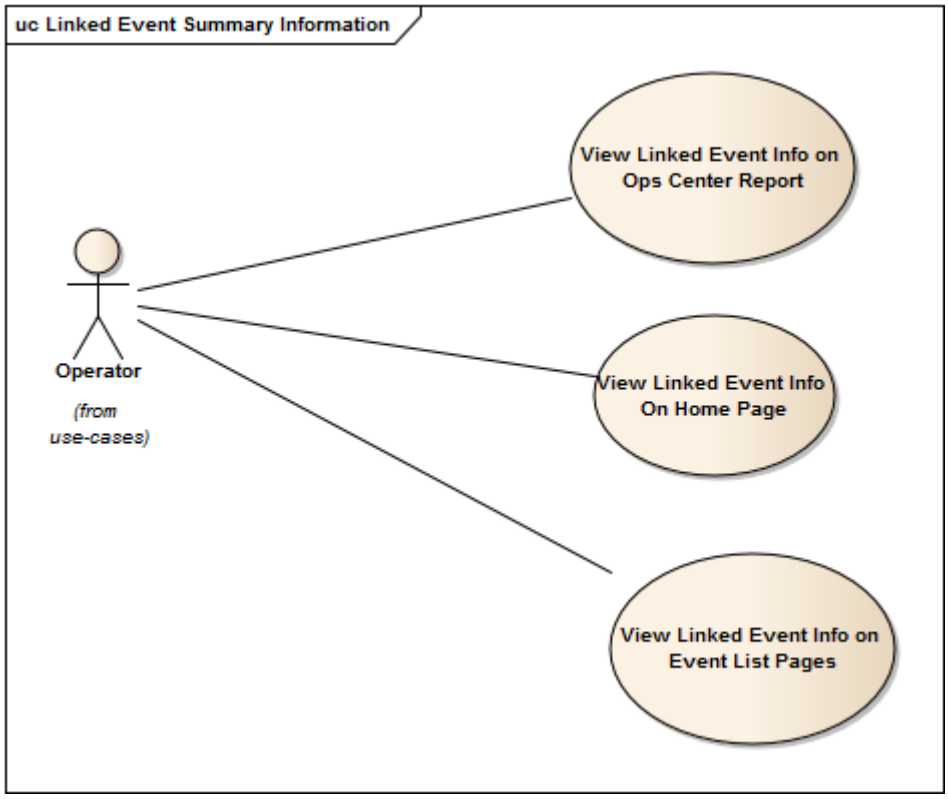


Figure 8-9. Linked Event Summary Information

8.2.4.1 View Linked Event Info on Event List Pages

An operator will be able to view the following Linked Event related information on the Open Event List and Open/Closed Event List pages: Linked CHART Events controlled by the ops center (including a visual indicator identifying it as a linked event), Indication of whether the column data is from an external source or an operator, Interesting External Events that are in the ops center's AORs and are not linked to a CHART Event, An visual cue if a Linked CHART Event has a External Event Updated indicator set for any field group.

8.2.4.2 View Linked Event Info On Home Page

An operator will be able to view the following Linked Event related information on the Home Page: Linked CHART Events controlled by the ops center (including a visual indicator identifying it as a linked event), Indication of whether the column data is from an external source or an operator, Interesting External Events that are in the ops center's AORs and are not linked to a CHART Event, An visual cue if a Linked CHART Event has a External Event Updated indicator set for any field group.

8.2.4.3 View Linked Event Info on Ops Center Report

An operator will be able to view the following Linked Event related information on the Operations Center Report: Linked CHART Events controlled by the ops center (including a visual indicator identifying it as a linked event), Indication of whether the column data is from an external source or an operator, Interesting External Events that are in the ops center's AORs and are not linked to a CHART Event, An visual cue if a Linked CHART Event has a External Event Updated indicator set for any field group.

8.3 MD 511 Integration

8.3.1 Manage Public Web Alert

This diagram shows the use cases related to configuration of Public Web Alert in GUI.

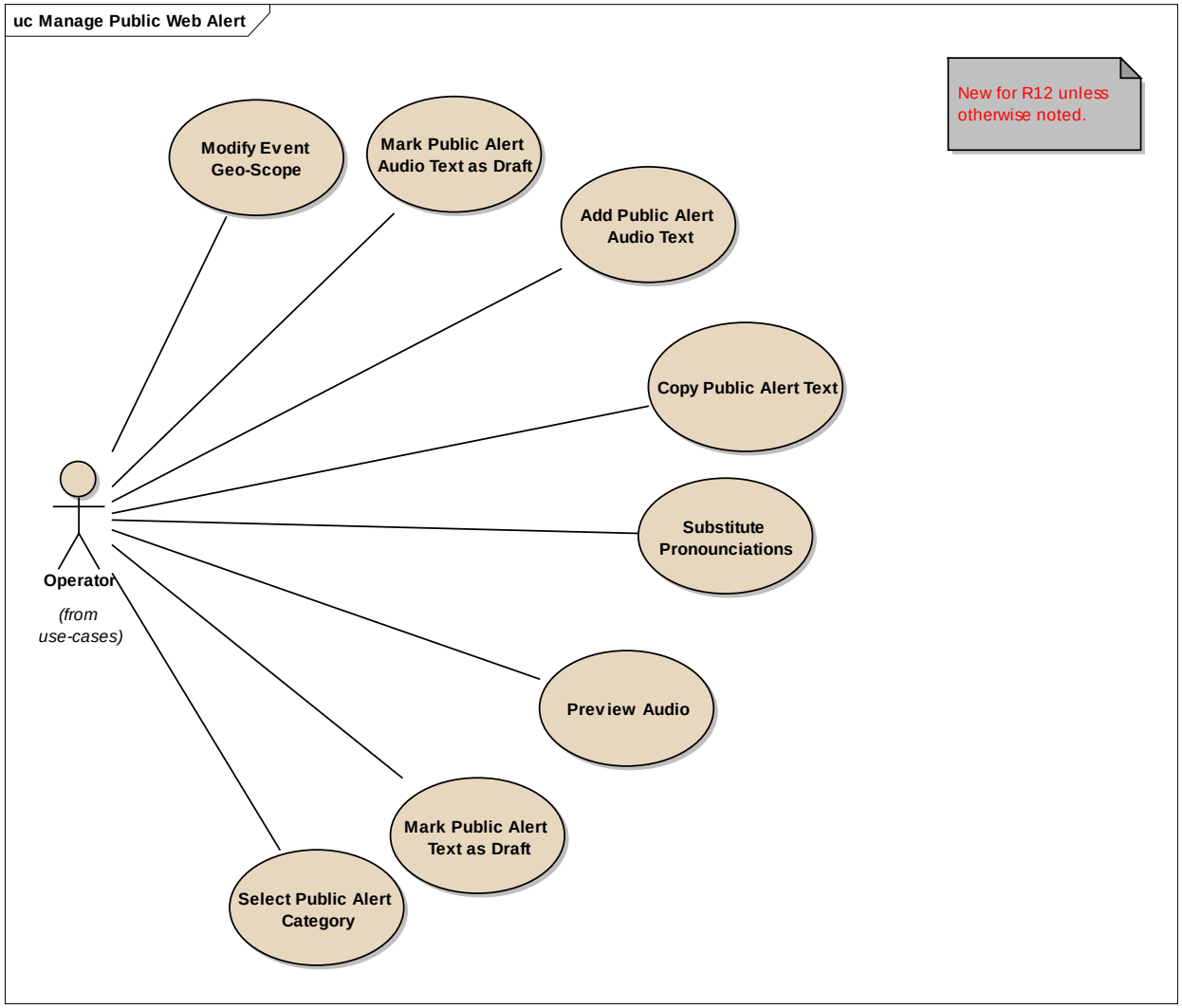


Figure 8-10. Manage Public Web Alert

8.3.1.1 Modify Event Geo-Scope

An operator with Manage Event functional right may modify the Geo-Scope of an event. The Geo-Scope value will indicate the scope of impact of the event in addition to the event location. The user can select a Geo-Scope value of the current Event Location, Route, County, State, or Region (Multi-State).

8.3.1.2 Mark Public Alert Audio Text as Draft

Allow user to mark a public alert audio text as a draft - i.e. not ready for public consumption. The system persist the text with the event but does not export it so CHART Web, RITIS, MD511, etc. do not see "draft" text.

8.3.1.3 Add Public Alert Audio Text

An operator with manage events right may add a public alert audio text message from the Edit General Info Page. The audio text will be associated with the geo-scope and exported to CHARTWeb and MD511 for use in setting floodgate messages.

8.3.1.4 Copy Public Alert Text

An operator with the manage events functional right may copy the Public Alert Text to the Public Alert Audio Text field on the Edit General Info Page.

8.3.1.5 Substitute Pronounciations

An operator with manage events functional right may substitute audio text pronunciations within the Public Alert Audio Text field on the Edit General Info page. The audio text will be substituted using text pronunciations from the HAR Dictionary.

8.3.1.6 Preview Audio

An operator with manage events functional right may preview the Public Alert Audio Text as audio on the Edit General Info page. The preview will use the CHART Text to Speech engine to convert the Public Alert Audio text field to audio.

8.3.1.7 Mark Public Alert Text as Draft

Allow user to mark a public alert text as a draft - i.e. not ready for public consumption. The system persist the text with the event but does not export it so CHART Web, RITIS, MD511, etc. do not see "draft" text.

8.3.1.8 Select Public Alert Category

Optionally select a public alert category for this event. The intent is to indicate to external systems such as MD511 that there is something special about this event. For example, MD511 might send notifications or alter the IVR experience of a group of users who have previously subscribed to this category. By default this value is “None”; other expected values are “General”, ”Amber/Silver”, and “Commercial Vehicle Operations.”

8.4 Decision Support – Routing

8.4.1 Configure Devices

This use case diagram shows use cases related to device configurations. New for R12, cameras can be configured to be decision support eligible.

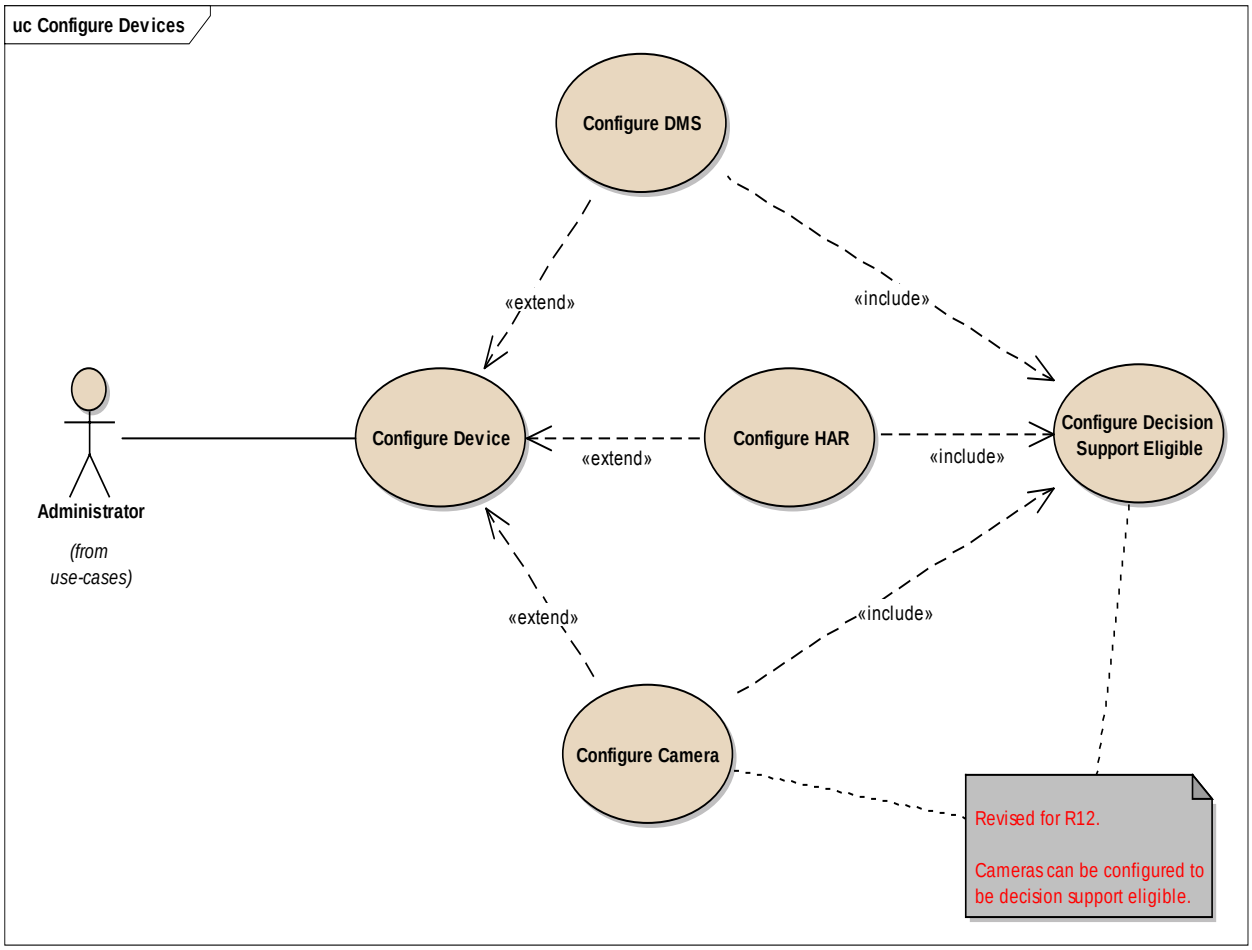


Figure 8-11. Configure Devices

8.4.1.1 Configure Camera

The system shall allow a user with appropriate rights to configure the settings for a camera.

8.4.1.2 Configure Decision Support Eligible

The system shall allow a user with appropriate rights to configure the decision support eligible flag. Devices that are configured to be eligible for decision support can be suggested for a traffic event response plan. New for R12, cameras can be configured to be decision support eligible.

8.4.1.3 Configure Device

The system shall allow a user with appropriate rights to configure a device.

8.4.1.4 Configure DMS

The system shall allow a user with appropriate rights to configure the settings for a DMS, unless it is an external DMS.

8.4.1.5 Configure HAR

The system shall allow a user with appropriate rights to configure the settings for a HAR.

8.4.2 Request Decision Support Suggestions

The system allows an operator to request suggested response plan actions for a traffic event through the use of the decision support sub-system. The decision support sub-system will generate suggested actions, as well as devices that are suggested to be revoked/removed from the response plan. The user may accept the suggested actions and add them to the response plan. The user may disable suggested actions either for the current request (temporarily) or for the life of the event (permanently). New for R12, the decision support sub-system will suggest devices and messages based on the attributes of the route from the suggested device to the traffic event. Also new for R12, a user may use (or disable) a suggested device directly from the Suggestions map. A user may also view the route from the suggested device to the traffic event on the Suggestions map.

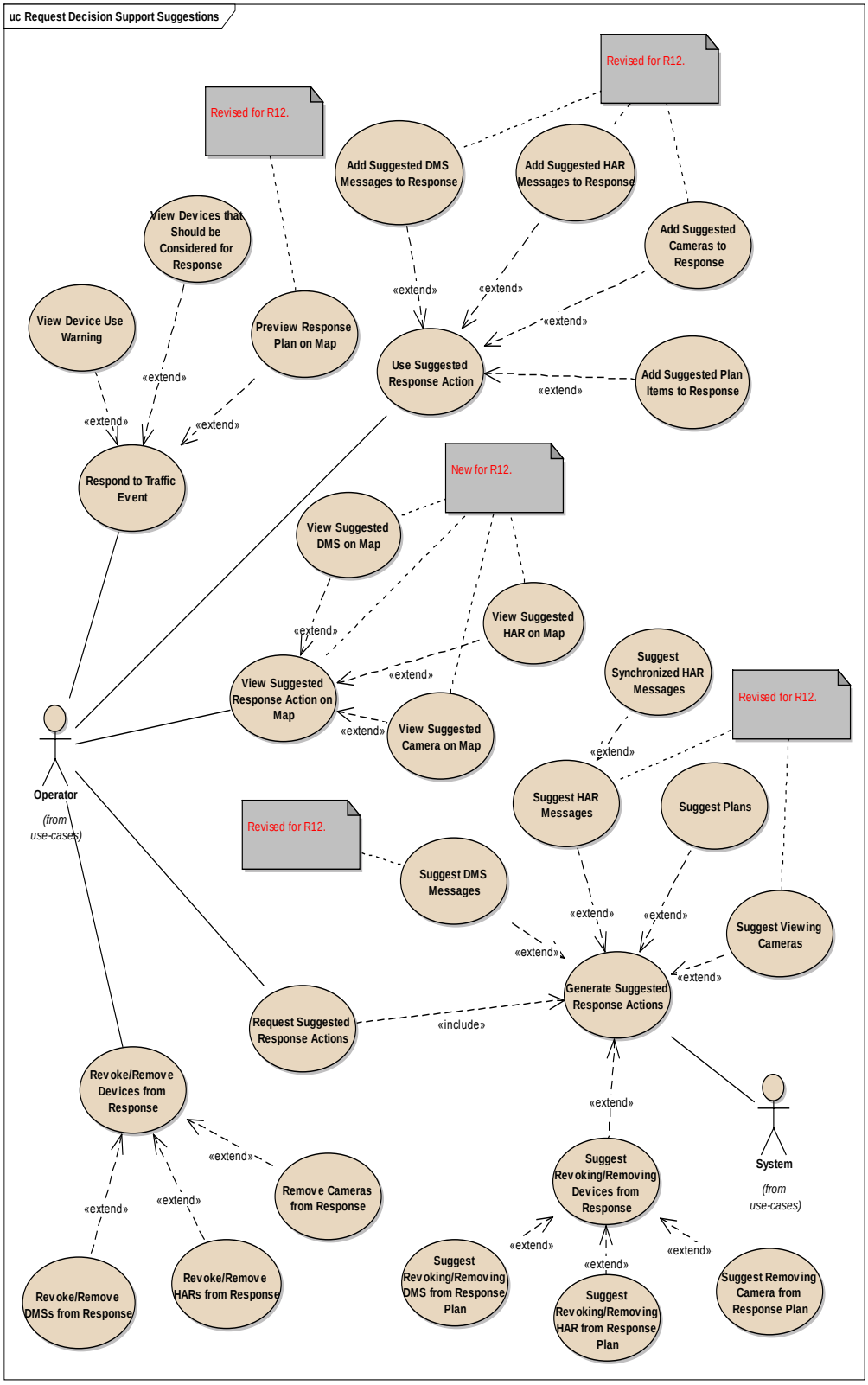


Figure 8-12. Request Decision Support Suggestions

8.4.2.1 Add Suggested Cameras to Response

A user with sufficient privileges may add one or more suggested cameras to the traffic event response plan video tour. New for R12, a user may add a suggested camera from the Suggestions map.

8.4.2.2 Add Suggested DMS Messages to Response

A user may add a suggested DMS message to the current response plan. If the device is already in the response plan, it will be updated to use the suggested message. The user may also activate the message immediately when adding it. New for R12, a user may add a suggested DMS from the Suggestions map. Also new for R12, a DMS can be added to the response plan with the No Message Change message option. If the DMS is not in the response plan, it will be added with no message. If the DMS is already in the response plan, the current message will not change. DMSs added from the Suggestions map will always use the No Message Change message option.

8.4.2.3 Add Suggested HAR Messages to Response

A user may add a suggested HAR message to the current response plan. If the device is already in the response plan, it will be updated to use the suggested message. The user may also activate the message immediately when adding it. New for R12, a user may add a suggested HAR from the Suggestions map. Also new for R12, a HAR can be added to the response plan with the No Message Change message option. If the HAR is not in the response plan, it will be added with no message. If the HAR is already in the response plan, the current message will not change. HARs added from the Suggestions map will always use the No Message Change message option.

8.4.2.4 Add Suggested Plan Items to Response

A user may add one or more suggested DMS or HAR plan item messages to the current response plan. If the device is already in the response plan, it will be updated to use the suggested message. The user may also activate the message immediately when adding it.

8.4.2.5 Generate Suggested Response Actions

In response to a request for suggested response actions from an Operator, the System will generate the suggested response actions for a traffic event. Refer to extending use cases to see what types of suggestions are supported.

8.4.2.6 Preview Response Plan on Map

A user may view a map that shows the traffic event, all currently planned response plan items, and any response plan items that should be considered. For each response plan item, the suggested message can be viewed by opening the device callout. DMS devices in the response plan that should not be considered (i.e. contain a U-turn in their route) will be highlighted on the map. Devices not in the response plan that should be considered (i.e. contain no turns in their route and are within the configurable distance) will also be highlighted on the map. This will help the operator to visualize the future state of the system if the response plan is executed as currently planned.

8.4.2.7 Remove Cameras from Response

A user may remove cameras from the response plan of a traffic event that have been suggested to be removed from the response plan.

8.4.2.8 Request Suggested Response Actions

A user with sufficient privileges may request the suggested response actions for a traffic event.

8.4.2.9 Respond to Traffic Event

The system allows an operator to control devices in response to an event through the use of a response plan. The user may add devices to the plan, select the desired state of the devices, then activate the plan. Any of the devices used by the event response plan may be deactivated while the event is open by removing the item for that device from the plan. When the event is closed, if the response plan is active, it will be deactivated automatically.

8.4.2.10 Revoke/Remove Devices from Response

A user with sufficient privileges may revoke/remove devices from the response plan of a traffic event that have been suggested to be revoked/removed from the response plan.

8.4.2.11 Revoke/Remove DMSs from Response

A user may revoke/remove DMSs from the response plan of a traffic event that have been suggested to be revoked/removed from the response plan.

8.4.2.12 Revoke/Remove HARs from Response

A user may revoke/remove HARs from the response plan of a traffic event that have been suggested to be revoked/removed from the response plan.

8.4.2.13 Suggest DMS Messages

The system will suggest template based DMS messages for DMS devices that are eligible for decision support and are located within a configurable distance of the traffic event. The configurable distance is based on the percent of lane closures in the direction of travel. The direction of travel is based on which direction lane closures exist (or the user entered direction of the event if no lane closures exist). Each device can have multiple template based suggestions. Each template is tested to verify that it is suitable for the traffic event type, distance, route attributes (new for R12), and sign geometry. Each suitable template will result in a suggested message. All parameter tags in a suitable template will be replaced with values from the traffic event (including the distance to nearest exit and the lane closure description) to create the suggested message. Suggestions are scored according to their specificity of the traffic event type, distance category, and route settings (new for R12). Thus, a template that pertains only to a traffic event of type Incident will be scored higher than a similar template that pertains to all traffic event types. Templates with higher scores are displayed to the user first. The system will also locate plans that contain the suggested DMS devices and will also suggest the planned messages for each of these devices. Because the system has no knowledge of the content of these messages they will be given the lowest possible score. New for R12, the route attributes for the DMS must be compatible with the route settings for the message template in order for a template based message to be generated. The route settings include: the maximum number of turns in the route, whether the route can contain a U-turn, and the supported route types in the route. Also new for R12, the No Message Change message option with be listed first for each DMS suggested.

8.4.2.14 Suggest HAR Messages

The system will suggest template based HAR messages for HAR devices that are eligible for decision support and are located within a configurable distance of the traffic event. The configurable distance is based on the percent of lane closures in the direction of travel. The direction of travel is based on which direction lane closures exist (or the user entered direction of the event if no lane closures exist). Each device can have multiple template based suggestions. Each template is tested to verify that it is suitable for the traffic event type, distance, and route attributes (new for R12). Each suitable template will result in a suggested message. All parameter tags in a suitable template will be replaced with values from the traffic event (including the distance to nearest exit and the lane closure description) to create the suggested message. Suggestions are scored according to their specificity of the traffic event type, distance category, and route settings (new for R12). Thus, a template that pertains only to a traffic event of type Incident will be scored higher than a similar template that pertains to all traffic event types. Templates with higher scores are displayed to the user first. The system will also locate plans that contain the suggested HAR devices and will also suggest the planned messages for each of these devices. Because the system has no knowledge of the content of these messages they will be given the lowest possible score. New for R12, the route attributes for the HAR must be compatible with the route settings for the message template in order for a template based message to be generated. The route settings include: the maximum number of turns in the route, whether the route can contain a U-turn, and the supported route types in the route. Also new for R12, the No Message Change message option with be listed first for each HAR suggested.

8.4.2.15 Suggest Plans

The system will also suggest plans that contain either DMS devices or HAR devices that are within the configurable range of the traffic event. Each plan that contains any suggested devices will be suggested. Plans will be scored according to the percentage of total plan items that are either suggested DMS devices or suggested HAR devices and will be presented to the user in order of score.

8.4.2.16 Suggest Removing Camera from Response Plan

The System will suggest cameras that should be removed from the response plan.

8.4.2.17 Suggest Revoking/Removing Devices from Response

The System will suggested devices that should be revoked/removed from the response plan (based on their distance to the traffic event) because they are no longer suggested for this event.

8.4.2.18 Suggest Revoking/Removing DMS from Response Plan

The System will suggest DMSs that should be revoked/removed from the response plan.

8.4.2.19 Suggest Revoking/Removing HAR from Response Plan

The System will suggest HARs that should be revoked/removed from the response plan.

8.4.2.20 Suggest Synchronized HAR Messages

The system will suggest template based messages for a Synchronized HAR device if the Synchronized HAR and all of its constituent HARs are eligible for decision support. The system

will suggest template based messages for a Synchronized HAR and all of its constituents if the Synchronized HAR or any of its constituents is within a configurable radius of the traffic event.

8.4.2.21 Suggest Viewing Cameras

The system will suggest cameras that are located within a configurable distance of the traffic event. The configurable distance is based on the percent of lane closures in the direction of travel. The direction of travel is based on which direction lane closures exist (or the user entered direction of the event if no lane closures exist). New for R12, only cameras that are configured to be eligible for decision support will be suggested. Suggested cameras are scored according to: whether the route contains a U-turn, the number of turns in the route, the distance to the traffic event, and the route types in the route. Cameras that are in the configured immediate distance will be scored such that the closest devices are scored the highest without regard for route or direction of travel. Cameras that are in the near or far distance categories will be scored such that a) cameras that have no U-turns in the route are scored higher than those with a U-turn, b) cameras with fewer turns in the route are scored higher those with more turns, c) cameras that are closer to the event are scored higher than those that are farther away, and d) cameras with fewer route types in the route are scored higher than those with more route types.

8.4.2.22 Use Suggested Response Action

A user with sufficient privileges may use a suggested response action. Refer to the extending use cases to see the list of supported response actions the user may use.

8.4.2.23 View Devices that Should be Considered for Response

If there are recommended devices (either DMS or HAR) that have not been added to the response plan, the user will be notified and can view the list of these devices. A DMS will be considered "recommended" if it is on the same route as the traffic event, within the configurable distance, and there are no turns in the route from the DMS to the traffic event. A HAR will be considered "recommended" if it is within the immediate distance or if it is on the same route as the traffic event, within the configurable distance, and there are no turns in the route from the HAR to the traffic event.

8.4.2.24 View Device Use Warning

If there are DMSs in the response plan that are not recommended, the user will be notified about these devices. A DMS will be considered "not recommended" if it is on the same route as the traffic event, is within the configurable distance, and contains a U-turn in the route from the DMS to the traffic event.

8.4.2.25 View Suggested Camera on Map

New for R12, a user may view the suggested camera and the route from the suggested camera to the traffic event on the Suggestions map.

8.4.2.26 View Suggested DMS on Map

New for R12, a user may view the suggested DMS and the route from the suggested DMS to the traffic event on the Suggestions map.

8.4.2.27 View Suggested HAR on Map

New for R12, a user may view the suggested HAR and the route from the suggested HAR to the traffic event on the Suggestions map.

8.4.2.28 View Suggested Response Action on Map

New for R12, a user may view the suggested device and the route from the suggested device to the traffic event on the Suggestions map.

8.4.3 Configure Decision Support General Settings

The system allows an administrator to configure the decision support general settings that are used to generate suggested actions (both devices and messages) for a traffic event response plan. The administrator may configure distances and route types. New for R12, an administrator can configure decision support route settings for DMSs, HARs, and cameras.

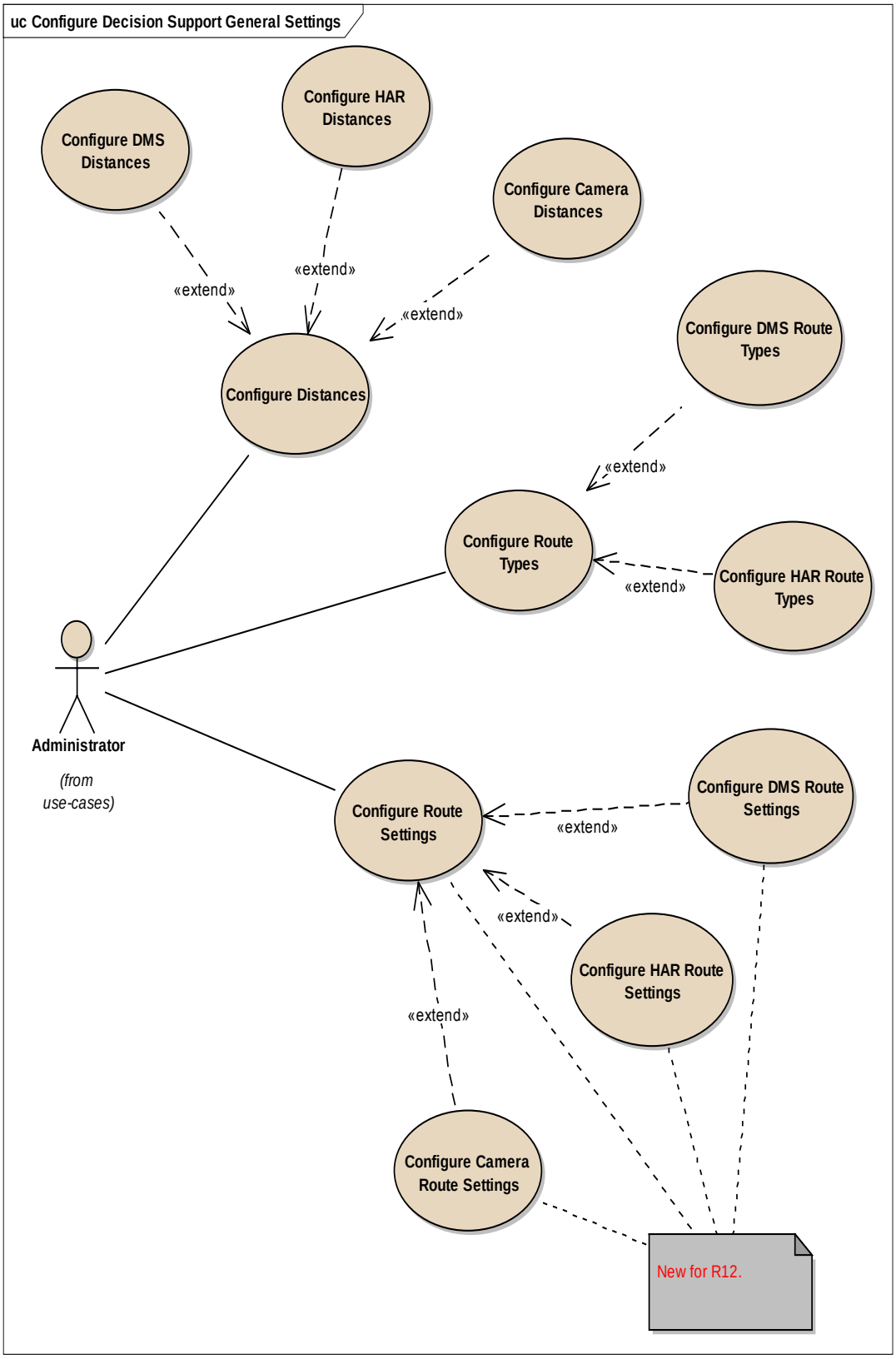


Figure 8-13. Configure Decision Support General Settings

8.4.3.1 Configure Camera Distances

A user may specify distance settings (maximum distance values and percentage of lanes closed) that are specific to camera devices.

8.4.3.2 Configure Camera Route Settings

New for R12, a user may specify route settings (maximum number of turns, whether to allow u-turns, and route types supported) that are specific to camera devices.

8.4.3.3 Configure Distances

A user with sufficient privileges may configure the decision support distance settings. A user may configure the 3 maximum distances (in miles) - one for each of the 3 distance types: Immediate, Near, and Far. A user may configure a lane closure percentage for the Immediate and Near distance types. These settings are used to determine whether a device should be suggested for a traffic event.

8.4.3.4 Configure DMS Distances

A user may specify distance settings (maximum distance values and percentage of lanes closed) that are specific to DMS devices.

8.4.3.5 Configure DMS Route Settings

New for R12, a user may specify route settings (maximum number of turns, whether to allow u-turns, and route types supported) that are specific to DMS devices.

8.4.3.6 Configure DMS Route Types

A user may specify route type settings (route type/number and route name) that are specific to DMS devices.

8.4.3.7 Configure HAR Distances

A user may specify distance settings (maximum distance values and percentage of lanes closed) that are specific to HAR devices.

8.4.3.8 Configure HAR Route Settings

New for R12, a user may specify route settings (maximum number of turns, whether to allow u-turns, and route types supported) that are specific to HAR devices.

8.4.3.9 Configure HAR Route Types

A user may specify route type settings (route type/number and route name) that are specific to HAR devices.

8.4.3.10 Configure Route Settings

New for R12, a user with sufficient privileges may configure the decision support route settings. The "route" refers to the route from the device to the traffic event. A user may configure the

maximum number of turns in a route (0 turns, 1 turn, 2 turns, 3 turns, 4 turns, 5 turns, or No Maximum). A user may configure whether to allow routes that contain a U-turn. A user may configure the route types that are supported in a route. These settings are used to determine whether a device should be suggested for a traffic event.

8.4.3.11 Configure Route Types

A user with sufficient privileges may configure the decision support route type settings. A user may configure the Route Type/Number and Route Name separately for each available route type. The route type settings will determine if a template will be suggested for a device based on whether a Route Type/Number tag or a Route Name tag exists in a device message template.

8.4.4 Configure Decision Support Message Templates

The system allows an administrator to configure the decision support message template settings that are used to generate suggested messages for a traffic event response plan. New for R12, an administrator can configure route settings (maximum number of turns, u-turns allowed, and route types supported) for DMS and HAR templates.

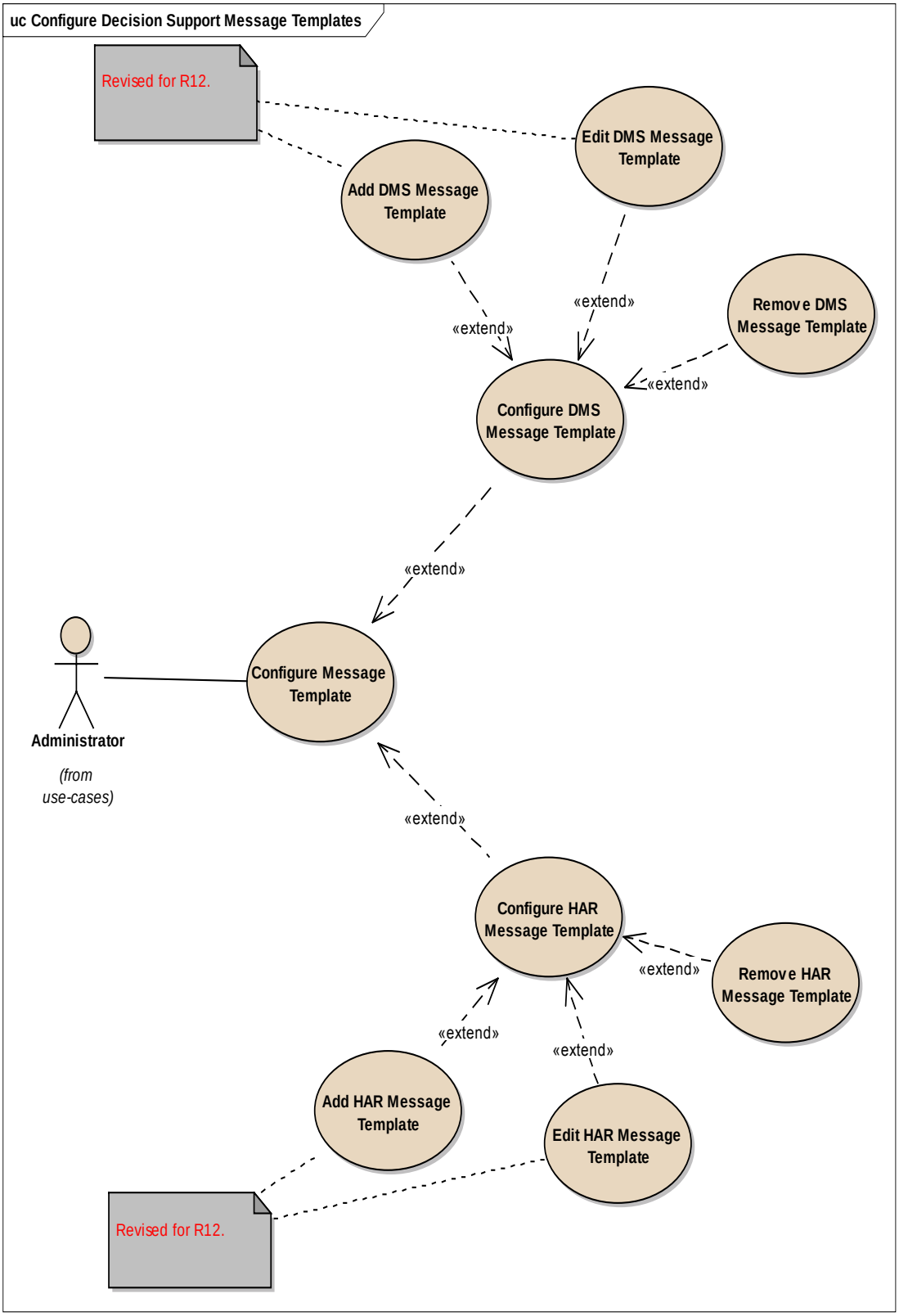


Figure 8-14. Configure Decision Support Message Templates

8.4.4.1 Add DMS Message Template

A user with sufficient privileges may create a new DMS message template. The user must configure the message (consisting of static text and parameter tags), applicable traffic event types, applicable distances, route settings (new for R12), and maximum sign width. The possible parameter tags include: traffic event type, incident type, route type, route number, route name, route direction, proximity to nearest exit, intersecting exit number, intersecting exit route type, intersecting exit route number, intersecting exit road name, distance to nearest exit (in miles), and lane closures. The resulting message can contain up to 2 pages. The maximum width can be used to restrict the use of the template on larger signs, or it can be set without a maximum. The system will allow the user to view an image of the template using sample data on any of the applicable DMS Display Configurations defined in the system. New for R12, a user can configure the following route settings: the maximum number of turns allowed in the route between the DMS and the traffic event, whether a U-turn is allowed in the route between the DMS and the traffic event, and the route types that are allowed in the route between the DMS and the traffic event.

8.4.4.2 Add HAR Message Template

A user with sufficient privileges may create a new HAR message template. The user must configure the message (consisting of static text and parameter tags), applicable traffic event types, applicable distances, and route settings (new for R12). The possible parameter tags include: traffic event type, incident type, route type, route number, route name, route direction, proximity to nearest exit, intersecting exit number, intersecting exit route type, intersecting exit route number, intersecting exit road name, distance to nearest exit (in miles), and lane closures. The system will allow the user to view a text preview of the template using sample data. New for R12, a user can configure the following route settings: the maximum number of turns allowed in the route between the HAR and the traffic event, whether a U-turn is allowed in the route between the HAR and the traffic event, and the route types that are allowed in the route between the HAR and the traffic event.

8.4.4.3 Configure DMS Message Template

A user with sufficient privileges may configure DMS message templates. These templates are used to generate message suggestions for a DMS. Refer to the extending use cases for the details of what can be configured for a DMS message template.

8.4.4.4 Configure HAR Message Template

A user with sufficient privileges may configure HAR message templates. These templates are used to generate message suggestions for a HAR. Refer to the extending use cases for the details of what can be configured for a HAR message template.

8.4.4.5 Configure Message Template

A user with sufficient privileges may configure decision support message templates. These templates are used to generate decision support message suggestions. Refer to the extending use cases for the details of what can be configured for a message template.

8.4.4.6 Edit DMS Message Template

A user with sufficient privileges may edit an existing DMS message template. The user may edit the current values for the message, applicable traffic event types, applicable distances, route settings (new for R12), and maximum sign width.

8.4.4.7 Edit HAR Message Template

A user with sufficient privileges may edit an existing HAR message template. The user may edit the current values for the message, applicable traffic event types, applicable distances, and route settings (new for R12).

8.4.4.8 Remove DMS Message Template

A user with sufficient privileges may remove an existing DMS message template.

8.4.4.9 Remove HAR Message Template

A user with sufficient privileges may remove an existing HAR message template.

8.5 H.264 Video

8.5.1 Configure Video

This diagram shows use cases related to adminstering video in CHART: Adding and editing cameras and monitors. (Removing cameras and monitors is unchanged in R12 and is not shown.)

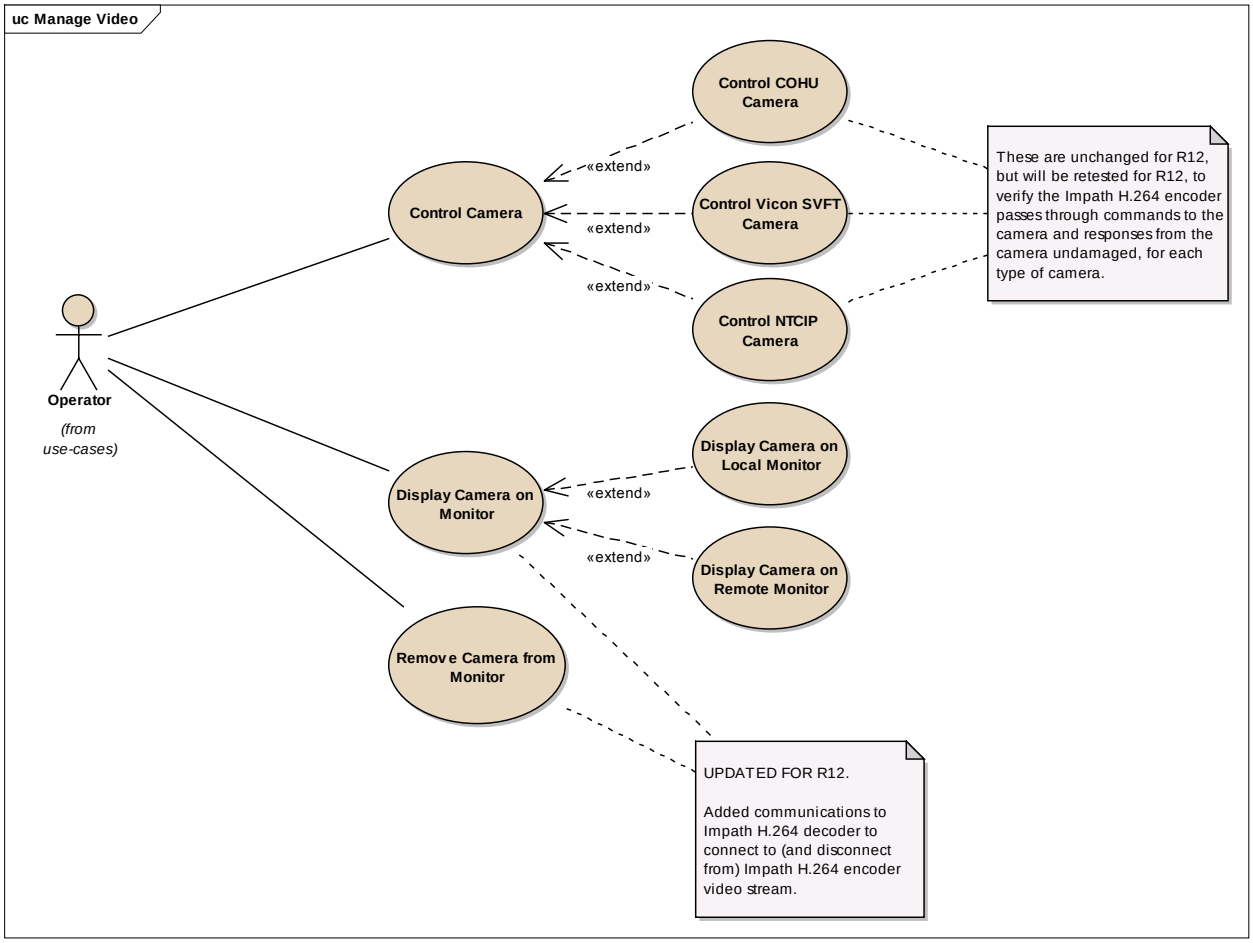


Figure 8-15. Configure Video

8.5.1.1 Add Controllable Camera

A suitably privileged user can add a controllable camera to the system. This can be from copying an existing camera, or adding a new camera from scratch. The camera can be a COHU 3955, Vicon Surveyor VFT (SVFT), or an NTCIP camera. This includes specification of the network connection site to which the camera is to be added (currently only one choice). Additional configuration is specified via the included Use Case.

8.5.1.2 Add Fixed Camera

A suitably privileged user can add a fixed camera to the system. This can be from copying an existing camera, or adding a new camera from scratch. This includes specification of the network connection site to which the camera is to be added (currently only one choice). Additional configuration is specified via the included Use Case.

8.5.1.3 Add Monitor

A suitably privileged user can add a monitor to the system. This can be from copying an existing monitor, or adding a new monitor from scratch. Configuration is specified via the included Use Case.

8.5.1.4 Add Video Source

A suitably privileged user can add a video source to the system. (Examples of video sources which are not cameras include output from a 2x2 or 4x4 image matrix combiner, a camera image from a third party (e.g., county, police), signal generator (for use as a moving No Video Available image, for instance), or DVR or other recording device.) This can be from copying an existing video source, or adding a new video source from scratch. This includes specification of the network connection site to which the source is to be added (currently only one choice). Additional configuration is specified via the included Use Case.

8.5.1.5 Configure Controllable Camera

This Use Case is used for both Adding and Editing a Controllable camera. Specific configuration is specified via the appropriate extending Use Case.

8.5.1.6 Configure Monitor

This Use Case encompasses the specification of all monitor parameters. A monitor must have exactly one receiving device. Configuration of the receiving device is provided via the appropriate extending Use Case.

8.5.1.7 Edit Controllable Camera

A suitably privileged user can edit an existing controllable camera. The camera can be a COHU 3955, Vicon Surveyor VFT (SVFT), or an NTCIP camera. Configuration is specified via the included Use Case.

8.5.1.8 Edit Fixed Camera

A suitably privileged user can edit an existing fixed camera. Configuration is specified via the included Use Case.

8.5.1.9 Edit Monitor

This diagram shows use cases related to adminstering video in CHART: Adding and editing cameras and monitors. (Removing cameras and monitors is unchanged in R12 and is not shown.)

8.5.1.10 Edit Video Source

A suitably privileged user can edit an existing Video Source. Configuration is specified via the included Use Case.

8.5.1.11 Remove Monitor

A suitably privileged operator can remove a Video Monitor which is offline.

8.5.1.12 Remove Video Source

A suitably privileged operator can remove a Video Source which is offline. This may be a camera of any type, or a non-camera type of video source (there is no distinction).

8.5.1.13 Specifiy Video Source Parameters

This Use Case encompasses the specification of all generic video source parameters. A video source may have any number of sending devices (zero or more). Configuration of sending devices is provided via the appropriate extending Use Cases.

8.5.1.14 Specify COHU Camera Parameters

This Use Case encompasses the specification of all COHU camera parameters. Additional configuration is provided via the included Use Cases.

8.5.1.15 Specify Decoder Parameters

This Use Case encompasses specification of decoder specific parameters. Parameters include the type of decoder (Core Tec MPEG-4 decoder, Impath VSG 1000 MPEG-2 decoder, Impath i5110-D H.264 decoder, or Impath VSG 5K-series decoder), the IP address and port for commanding the decoder.

8.5.1.16 Specify Encoder Parameters

This Use Case encompasses specification of encoder specific parameters. Parameters include the type of encoder (Core Tec MPEG-4 encoder, Impath VSG 1000 MPEG-2 encoder, or Impath i5110-E H.264 encoder), the IP address and port for the encoder itself and for the multicast video stream it provides.

8.5.1.17 Specify Fixed Camera Parameters

This Use Case encompasses the specification of all basic camera parameters. Additional configuration is provided via the included Use Case.

8.5.1.18 Specify NTCIP Camera Parameters

This Use Case encompasses the specification of all NTCIP camera parameters. Additional configuration is provided via the included Use Cases.

8.5.1.19 Specify SVFT Camera Parameters

This Use Case encompasses the specification of all Vicon Surveyor VFT (SVFT) camera parameters. Additional configuration is provided via the included Use Cases.

8.5.1.20 Specify Video Switch Port Parameters

This Use Case encompasses specification of video switch port parameters, namely the video switch and the specific video port to which the device is attached.

8.5.2 Manage Video

This diagram shows use cases related to routine operator video functions: displaying cameras on monitors and controlling cameras.

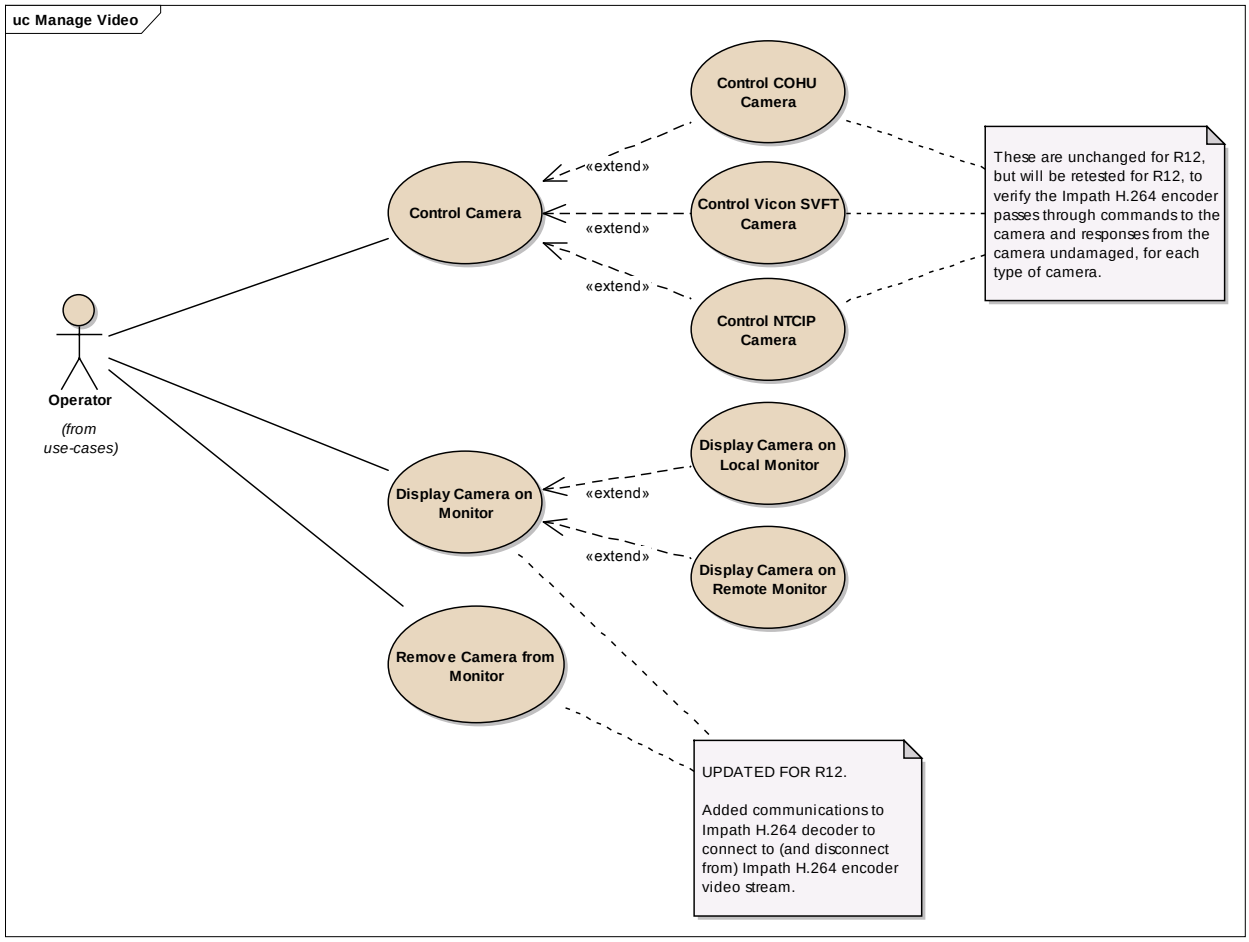


Figure 8-16. Manage Video

8.5.2.1 Control COHU Camera

A user can issue control commands to a COHU camera that are specific to or customized for a COHU camera, including pan, tilt, zoom, adjust focus, iris, reset the camera, and directly control the line 1 title and line 2 title.

8.5.2.2 Control Camera

A suitably privileged operator shall be able to control cameras, including requesting the control session itself, as well as performing these standard camera control operations: pan, tilt, zoom, focus (when in manual focus mode), toggle auto focus, iris (when in manual iris mode), toggle auto iris, color balance (when in manual color balance mode), toggle auto color balance, save up to ten persistent presets, save temporary presets in association with a traffic event, move to preset, delete preset, and power camera on and off. Saving a persistent preset includes

specifying the preset number and preset title. This use case is extended by model-specific use cases providing more specific functionality.

8.5.2.3 Control NTCIP Camera

A user can issue control commands to an NTCIP camera that are specific to or customized for an NTCIP camera, including pan, tilt, zoom, adjust focus, iris, and directly control the line 1 title and line 2 title.

8.5.2.4 Control Vicon SVFT Camera

A user can issue control commands to a Vicon SVFT camera that are specific to or customized for an SVFT camera, including pan, tilt, zoom, adjust focus, iris, color balance, reset the camera, view the title lines, control one of the title lines, and enter Program Mode. Within Program Mode, the user can send up, down, left, right, AUX1, AUX2, AI/Backout, and AP/Select commands.

8.5.2.5 Display Camera on Local Monitor

This use case extends Display Camera on Monitor by testing the user's permission to display images on monitors within the user's own local Monitor Group.

8.5.2.6 Display Camera on Monitor

A suitably privileged operator can display a camera or other video source on a monitor (or on multiple monitors at once). The CHART ATMS supports this for video sources and monitors connected via IP CODECs or V1500 Switch Ports. The system automatically selects the video sending device associated with the video source which is on the same video fabric as each monitor's video receiving device, if the video source has multiple sending devices and one of them matches the monitors receiving device. IP sending/receiving devices supported include CoreTec MPEG4, Impath MPEG2, and Impath H.264. The monitor(s) may be local (in the user's Monitor Group, generally associated with the user's physical location (room)) or remote.

8.5.2.7 Display Camera on Remote Monitor

This use case extends Display Camera on Monitor by testing the user's permission to display images on monitors outside of the user's own local Monitor Group.

8.5.2.8 Remove Camera from Monitor

A suitably privileged operator can remove the image of a camera or other video source from a monitor.

9 System Interfaces Design (IDL)

For convenient viewing, new and modified IDL designs are included in a separate document for viewing with a browser. Open the file `index.htm`. See the example below for where to find links to the classes → IDLInterfaces diagrams.

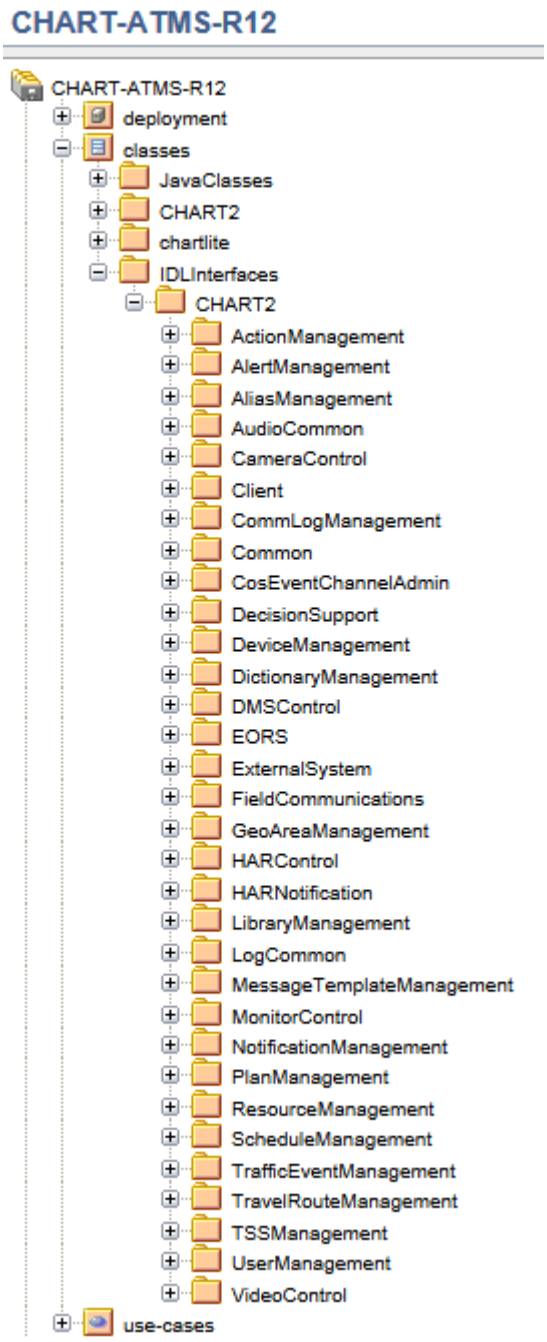


Figure 9-1. Where to find IDL Interfaces classes in HTML Design

10 Package Designs

For convenient viewing, new and modified package designs are included in a separate document for viewing with a browser. Open the file `index.htm`. See the example below for where to find links to the classes → CHART2 diagrams.

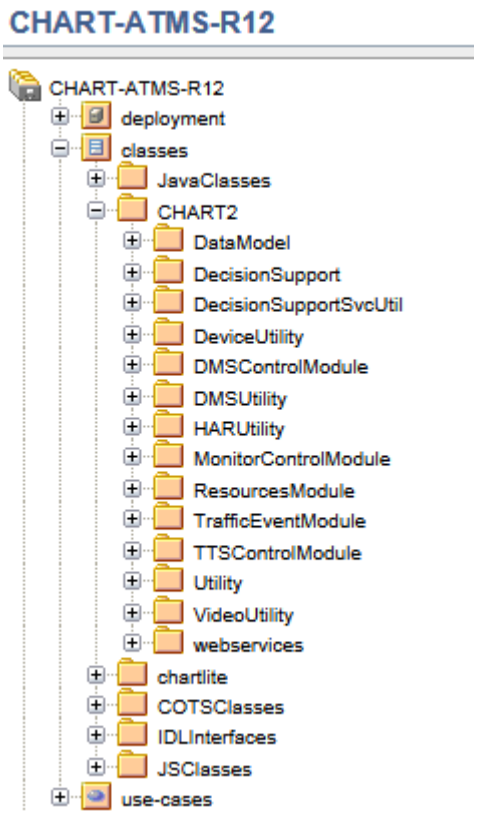


Figure 10-1. Where to find CHART2 classes in HTML Design